Supplement to the "Queensland Agricultural Journal," July, 1931.

VOLUME XXXV

QUEENSLAND AGRICULTURAL JOURNAL

Issued by direction of

The Hon. the Secretary for Agriculture

Edited by J. F. F. REID

JANUARY to JUNE, 1931

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/- including postage.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXV. 1 JANUARY, 1931. PART 1.

Event and Comment.

A Thought for the New Year.

MR. WALKER, in his New Year message to farmers, has given us an inspiring thought. "We owe something more to Australia," he says, "than merely weighing the harvest and taking tally of the yearly yield. We owe her good and continuous service in every department of life." Service, after all, is the glory of life, its only real glory. So let us teach service to Australia, preach it everywhere, and practice it ourselves. National life cannot be expressed in pleasant little platitudes. National life is something more than just an academic phrase, something more than a happy abstraction, a theme only for after-dinner speeches. National life is real and significant, and every day it becomes more varied and complex and, if we may say so, more scientific. Our idea of individual responsibility requires, possibly, even stronger reinforcement.

When all sections of the community become sufficiently interested—the hard economic facts facing us to-day are compelling that interest—and come together in one capacity or another for consultation and decision, then shall the nation be really organised—an organisation that will mean better control and direction of industry, the avoidance of all waste in our enterprises, and a spirit of reciprocal trust and co-ordination of effort diffused among all classes.

A new year has begun. Fresh opportunities are opening before us. Now and not to-morrow is the time to prepare to accept them.

Tobacco Fertilisers.

YEARS ago all our tobacco was grown on rich soils requiring no fertilisers, but now poorer soils of suitable mechanical condition, and which unquestionably require the help of artificial fertilisers, are selected. Whilst it is an easy matter to recommend a formula for fertiliser applications to increase the weight of the crop, we will require extended practical experience in Queensland to ascertain how such an application will affect the smoking quality of the tobacco, on which the value of the crop chiefly depends. In August of this year a conference of agricultural workers representatives of fertiliser industries, and officers interested in tobacco culture in the United States of America, was held at Oxford N.C. to agree on recommendations with regard to the use of artificial fertilisers for tobacco culture on all average American soils, and was reported in the September number of the "American Fertiliser."

For the growth of bright flue-cured tobacco on heavy or more productive soils, 800 lb. to 1,200 lb. per acre of 3-8-5 mixture was recommended. On the light or less productive soils 4-8-6 mixture was preferred. In these fertiliser mixtures the nitrogen to be supplied is at least ¼ by nitrate of soda, ½ by high-grade organic material like cotton seed meal, fish, or meat meal, the remaining ¼ by urea or other inorganic sources. Phosphoric acid must be in form of high-grade superphosphate. Potash is used in the form of high-grade sulphate which should not contain more than 2 per cent. of chlorides. In many cases the addition of magnesia may be a great advantage, and the mixed fertiliser should supply 2 per cent. of magnesia. Part of the fertiliser can, with advantage, be supplied as top dressing about three weeks after planting.

For dark tobacco (sun-cured and shipping) the recommendations are to use 600 lb. to 1,000 lb. of the 3-8-3 mixture mixed in the drill, and part of it ten days after planting. For plant beds the chloride contents should not be more than 1 per cent., and a mixture 5-8-3 with 1 per cent. of magnesia is recommended. Until we have carried out fertiliser experiments of our own, we have to follow the American recommendations and use the mixed fertilisers.

Banana Marketing.

THE Minister for Agriculture and Stock (Hon. H. F. Walker, M.L.A.) remarked recently that his attention had again been drawn by the Minister for Agriculture in New South Wales (Hon. W. F. Dunn, M.L.A.) to the laxity displayed by some Queensland banana-growers in the grading of fruit intended for the New South Wales market. Mr. Dunn pointed out that it was unfortunate that growers were not acting up to the Regulations gazetted at their own request, and in addition to not grading the fruit allowed under the Regulations, in conformity with the various grades, they were sending much fruit which did not comply with any grade. Whilst up to date no legal proceedings had been taken against any of the defaulting growers, it must be realised that in the interests of the industry something must be done to place the marketing of bananas on a satisfactory footing. The New South Wales Department of Agriculture, Mr. Walker continued, was sending the names of the growers who did not grade according to the Regulations to the Queensland Department, and the agents of the Banana Industry Board in the districts concerned were being instructed to strictly enforce the Regulations in instances where fruit was not graded and cases branded as required.

The Banana Industry Protection Board.

MR. WALKER stated recently that since the appointment of the Banana Industry Protection Board that body had given attention to various phases of the banana industry, but it was not until August of this year that agents and other members of the staff were appointed, consequently efforts before then were more or less circumscribed. Attention has been devoted mainly to the eradication of neglected and abandoned plantations, and as a result some 2,220 acres had been completely eradicated prior to the 31st Novemoer. A further fairly large acreage is in process of eradication.

Prior to the advent of the planting season, a planting policy was decided upon and published. This policy appears to have given general satisfaction. Owing to some changes in the allocation of agents where the appointments had been made from the staff previously working under the Diseases in Plants Act, and two of the other appointees declining to accept their positions, a little unavoidable delay was occasioned, but not sufficient to have any material influence on matters incidental to

planting. This has been fairly heavy, 1,500 permits having been issued before the end of November. With the termination of the planting season it is proposed to give closer attention to the eradication of diseased and abandoned plantations, it being fully recognised that best results cannot be obtained from other places while these are allowed to remain to breed and disseminate disease. The close scrutiny which has been maintained over the northern boundary of infestation of Bunchy Top will be continued. Odd instances of reappearance of the disease have been recorded during the past season, but on the whole the position in this respect may be regarded as satisfactory, though further south the necessity for closer attention still exists. In the South Coast district large areas have been eradicated, and planting has been extensive. With few exceptions, which include some of the Bay islands, the position is reasonably satisfactory. In the Coomera district exception is taken to the indifference displayed by certain growers, one of whom has been twice prosecuted and fined. Further orders have been issued on these defaulters.

Dairying in Queensland..

NEARLY every dairying district had a prosperous year. The output of butter for Queensland exceeded that of the previous peak year, 1928-29, by over one and a-half million pounds. Cheese production, however, fell short of that of the same year. The total quantity of butter manufactured during the term was 75,999,058 lb., and of cheese, 12,374,705 lb. In addition, 1,999,659 lb. of condensed milk was made; a large quantity of coffee and milk and "Bettabread" was also produced from milk supplied to the condensary. Production was fairly regular from month to month. As a result of a succession of good years, the industry is expanding rapidly. In the Central and Northern Divisions development has been remarkable. Herd improvement is extending in practice among dairy farmers to the general benefit of the industry. The replacement of more or less depreciated plants with large modern factories was a notable feature of the year's progress. Butter and cheese factories now in operation number respectively 51 and 64. A condensed milk factory is also working.

The amount of capital now invested in the industry in this State is estimated at £37,000,000. The value of the output for the year just ended was approximately £7,500,000.

An analysis of grading results shows a considerable improvement in quality of dairy products. The condition, body, and texture of the butter examined was generally excellent, due to modernised factory equipment. The output of a few factories, however, was below the generally high standard of Queensland butter. The quantity of second-grade butter is still too great, and corrective measures are being adopted. Improvements in factory practice were observed, and much educational effort was directed towards ensuring the delivery of first-quality cream.

Second-grade cream is still coming forward in too great a volume, though this fact may be attributed in part to the bountiful growth of herbage on our pastures that give strong flavours to the product. This condition is largely corrected, however, in the process of pasteurisation and deodorisation at the factory; but it is obvious that greater efficiency in the production and handling of cream is required on those farms supplying the lower grades. Through its instructional services the Department is aiming to reduce the output of inferior cream to a minimum.

Cheese manufacture is confined chiefly to the Darling Downs, and, though last year's production was less, Queensland is still the largest exporter in the Commonwealth. There was a noticeable improvement in quality, but there is room for still greater improvement, and this would follow if all the milk delivered were up to the standard of that supplied by the careful methodical producer.

It is pleasing to report that the efforts of the Department to extend a system of purebred herd recording have met with the approval of studmasters generally, and increased activity in this important direction has resulted.

Better packing of butter has followed the recommendations of a Special Committee appointed to inquire into the causes of so-called "wood taint." As a result of experiments undertaken by this committee of investigation, it is possible that an important discovery will be revealed in regard to surface deterioration of boxed butter. Until recent years Queensland butter was packed in a neat, well-made. uniform cube box, but, with advancing prices for timber, much cheaper containers have come into use. This change in "get-up" is of doubtful value, and a medley of butter boxes is no advertisement for either the timber or butter industries. It is suggested that there would be wisdom in a further consideration of this seemingly small but actually important point in our butter marketing.

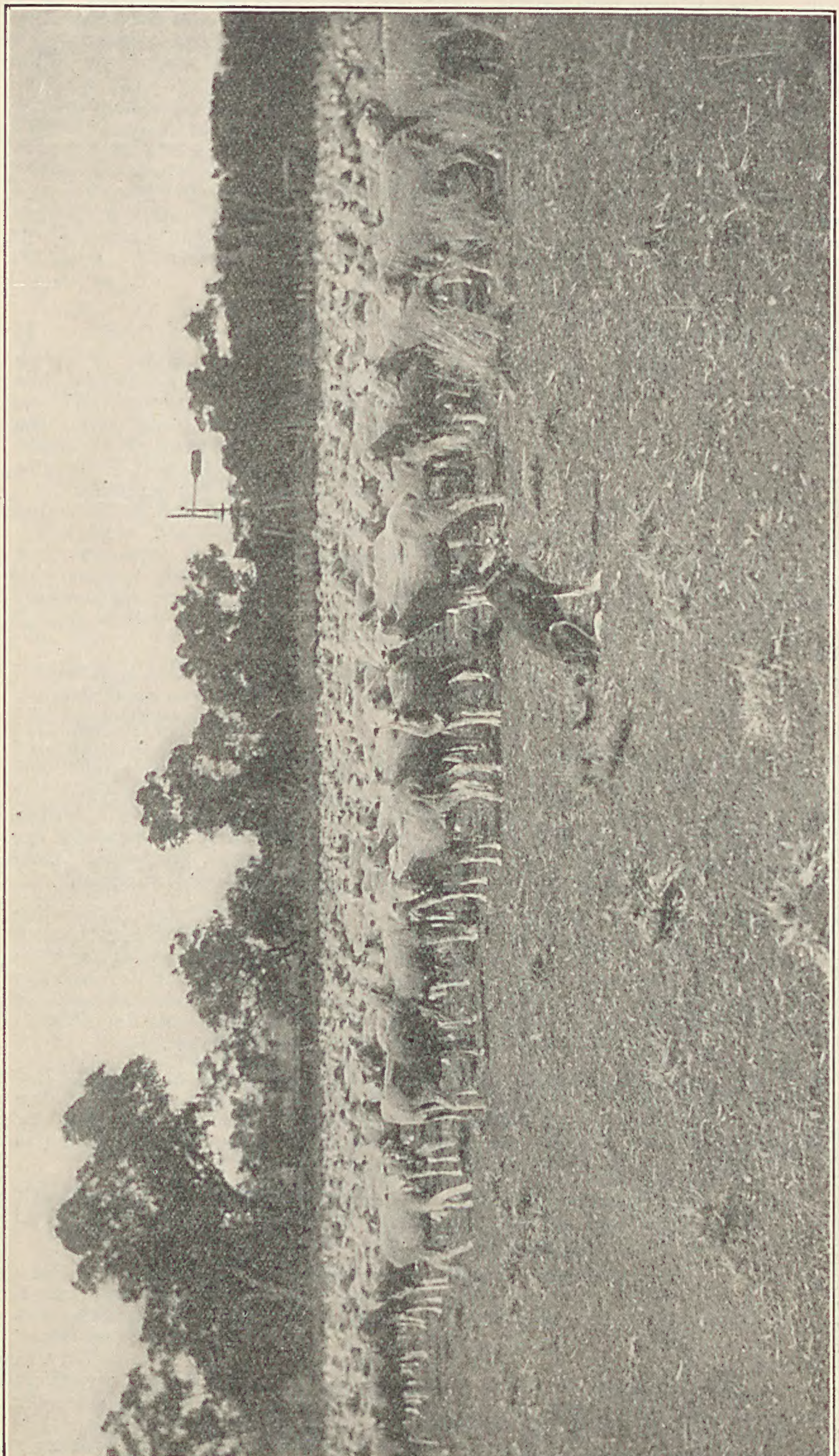


PLATE 1.—ON GUARD. THE SHEPHERD WATCHES HIS FLOCK.

A scene on a Western Queensland sheep run.

The Minister's New Year Message.

TO THE FARMERS OF QUEENSLAND.

Department of Agriculture and Stock,
Brisbane, 31st December, 1930.

Out of the experiences of the past year has come a more general realisation of the fact that primary production is the life blood of Australia's economic existence. In this time of difficulty, to the land we turn naturally as the source of our national stability. The farmers of Queensland have responded nobly to the call for increased production which is the real material wealth of the country. Prosperity for commerce and community services can only come from the primary industries.

We all owe something more, however, to Australia than merely weighing the harvest and taking tally of the yearly yield. We owe her good and continuous service in every department of life. "Faith without good works is dead."

In all our undertakings good team work is essential; anything less at this juncture would constitute a challenge to our common sense and to the real Australian spirit—the spirit that manifested itself so magnificently in 1914 and in the fateful years that followed.

Confidence and courage are the keynotes of our national character, and in all those things by which a nation is built Queensland farmers have not been found wanting.

In the coming year, I trust that happiness will remain in your homes, that you meet with the success you deserve in all your enterprises, and share abundantly in the return to greater prosperity which we know must come.

Harry F. Walker

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report of research work in connection with the life-cycle stages and economy of our little known species of Scoliidæ named Scolia formosa Guer., September to October, 1930, from the Entomologist at Meringa, Mr. E. Jarvis.

DIGGER-WASP PARASITES.

To most people the word wasp suggests something painful in the way of a sting, this being only natural when the insect chances to belong to the Vesipidæ, a family which includes such pests as the well-known hornets, several species of which attach their paper-like nests of cells to the under surfaces of cane leaves. Most growers have been attacked by these wasps at some time or other, and been forced to entertain a certain amount of respect for them.

We who live in the tropics are well acquainted also with another tribe of hymenoptera, known commonly as "Mason wasps," many of which build their mud nests within our houses, in corners of rooms or ceilings, or in keyholes, &c. Such obtrusive familiarity, however, may, I think, be excused on the ground that members of the family Sphegidæ to which these latter insects belong, although arrayed in warning colours of red, yellow, and black, and well able to sting, are not in the least aggressive or resentful if interfered with.

In the present article we shall consider a decidedly useful insect, belonging to a smaller assemblage of stinging species known as "digger wasps," which being parasitic on root-eating scarabæid grubs, such as those of our various cane-beetles, should be regarded as friends of the canegrower.

A LITTLE KNOWN QUEENSLAND DIGGER-WASP.

Scolia formosa Guer., which is closely related to our well-known digger-wasps *Campsomeris tasmaniensis* Sauss. and *C. radula* Fabr., was first bred by the present writer in 1920 from a specimen captured at Gordonvale, which lived eight weeks in confinement, and deposited twenty-four eggs on grubs of the greyback cockchafer. (See Bulletin No. 17, p. 76.)

Description of Female Wasp (Fig. 1).

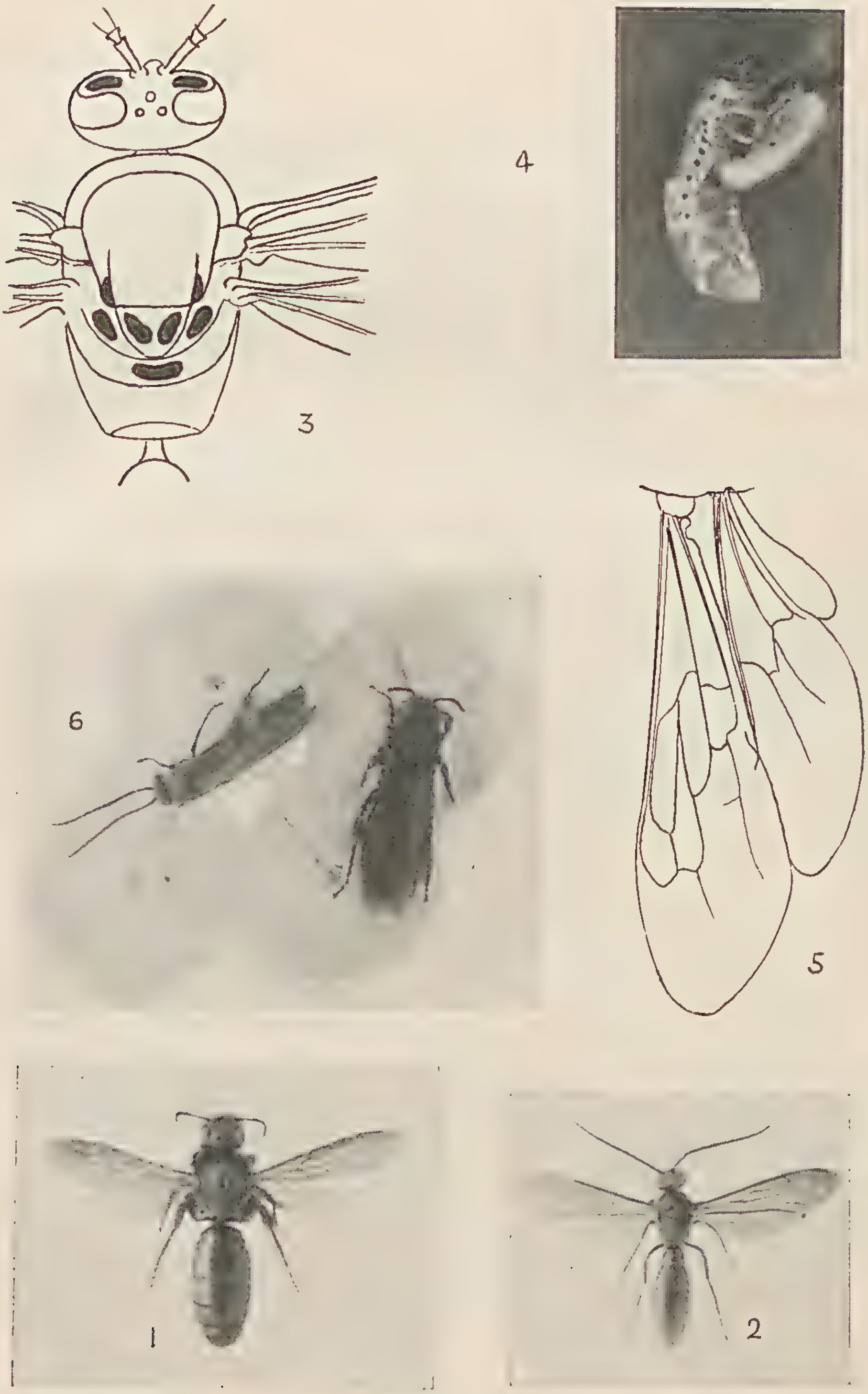
This handsome insect, measuring 22-24 mm. in length (about 1$\frac{3}{8}$ inches), is black, clothed more or less densely on head, pronotum, and legs with dark-reddish hairs. The abdomen is barred transversely with five rather broad bands of chrome yellow, while the wings are pale smoky yellow, clouded on costal portion near apex with dark grey. Wing expanse about 43 mm.

Description of Male Wasp (Fig. 2).

Of the usual slender form, 17 to 19 mm. long. (about $\frac{3}{4}$ inches) black, with three light-yellow abdominal bands, interrupted centro-dorsally. Legs and body sparingly clothed with reddish hairs. Labrum, prothoracid collar, coxæ, and under surfaces of femora light yellow; the labrum with a large angular black central patch. The slightly raised shining yellow blotches (which in male scoliid wasps afford good specific distinctions) are small, somewhat obscure, and arranged in positions shown in Fig. 3) large and whitish. Wings expanding about 33 mm., pale ochraceous, clouded on apex with dusky grey.

Habits of the Female Digger-Wasp.

Unlike the hornets and mud-wasps alluded to above, these grub parasites avoid the haunts of man, being, in fact, seldom seen unless searched for amongst the honey-bearing blossoms of certain herbaceous plants. During sunny days the female wasps



E. Jarvis, Del. and Photo.]

PLATE 2.

Fig. 1—*Scolia formosa* Guer. female, natural size.
Fig. 2—*Scolia formosa* Guer. male, natural size.
Fig. 3—Diagrammatic sketch of head and thorax of male wasp of *formosa*, showing position of yellow blotches—2 on front of head and 7 on thorax, figured in solid black.
Fig. 4—Grub of cane-beetle, *Lepidiota frenchi* Blkb., being sucked dry by a maggot of *Scolia formosa* Guer.
Fig. 5—Arrangement of nervures on wings of female wasp of *Scolia formosa*; × 4½.
Fig. 6—Male and female wasps of *formosa* at rest on flowers with wings closed.

E. Jarvis, Photo.] PLATE 3.—SIDA CORDIFOLIA.

A honey-bearing plant which is much favoured by Digger-wasp Parasites of the genus Campsomeris. *Inset*—Seeds of same, natural size.

usually feed between the hours of 10 to 11.30 a.m., the afternoon being probably passed in searching for suitable larvæ upon which to oviposit. To locate the exact position of a grub when it happens to be lying at a depth of 4 to 6 inches or more in firm uncultivated forest land overgrown with vegetation, would seem to us a well-nigh impossible task; and yet this female parasite, whilst flying along through the scented bush, is able, by the aid of some marvellous sense which we do not possess, to immediately detect the presence of its underground host. Suddenly pausing in her flight and dropping to the ground, she feverishly commences to burrow downwards into the soil. Upon reaching the grub it is soon stung into the desired state of paralysis, after which the wasp cooly attaches an egg to the body of the victim; the maggot ultimately hatched from the same being destined to flourish and grow fat upon the living juices of its helpless host (Fig. 4). Before all this can happen, however, a fierce combat has first to be fought out in subterranean darkness, while the wasp's intelligence is being matched against the greater strength and more powerful jaws of its opponent.

Details of the Life Cycle of *Scolia formosa* Guer.

The winter brood of this digger-wasp, which will now be described, is interesting from a biological standpoint, since meteorological conditions during the course of our cooler months exercise no little influence on the duration of the metamorphosis of scoliid wasps. The time required for completion of the combined egg and larval stages of this insect was found to be twenty to twenty-four days, while its entire life-cycle (from egg to adult wasp) under an average shade temperature of 68 degrees Fahr. occupied about 105 days. Comparing these results with data obtained in 1917, and summarised later in the "Queensland Agricultural Journal" (vol. xviii., pp. 42-43) respecting the summer brood of *Campsomeris tasmaniensis* Sauss., which is a digger-wasp of about the size of *Scolia formosa* Guer., it appears that a fall of 18 degrees Fahr. in average shade temperature is sufficient to cause a difference of about three months between the duration of winter and summer broods of species of Scoliidæ.

The insect in question, which has just been bred successfully at Meringa, was caught on 23rd May, and lived sixty days in confinement, depositing a total of thirty-five eggs upon grubs of our greyback cockchafer. The breeding period, however (from laying of first egg to emergence of last wasp), lasted 137 days (27th May to 11th October), resulting in the production of fourteen cocoons, nine of which produced wasps, six being of the male and three of the female sex. The average number of days passed in the egg, larval, and cocoon conditions were seven, sixteen, and eighty-three respectively, while the complete life-cycle occupied from 101 to 114 days. These results were satisfactory, as up to the present the male of *S. formosa* has never, to my knowledge, been captured here on the wing, and was not represented in our official collection of insects.

Host Grubs of *Scolia formosa* Guer.

While studying the economy of this species, larvæ of different cane beetles were confined in a breeding-cage with one of the female *formosa* just bred here, in order that host relationships might be determined. Although refusing to take notice of larvæ of *Dasygnathus australis-dejeani* Macl. or *Cocachroa decorticata* Macl., oviposition occurred readily on grubs of *Lepidiota caudata* Blkb. and *L. consobrina* Gira., but reluctantly on those of *L. frenchi* Blkb. and *Anomala australasiæ* Blkb. The principal hosts of *S. formosa* will, I think, be found to be the greyback and glossy scrub cockchafers, which happen to be species of primary importance as insect pests of sugar-cane.

Flowers Which Attract Digger-Wasps.

Each canegrower can do a little towards the better establishment of scoliid grub parasites in the immediate vicinity of his own canefield. Species of honey-bearing flowers known to attract these useful wasps should be encouraged to grow close to headlands, or when altogether absent the seed be sown here and there on open spots adjoining the fences. In the event of grubs being present under the cane near at hand the chances are that these parasites after having taken their fill of honey and flown off over the field would start ovipositing on host grubs so conveniently situated. The following flowers suitable for such purpose occur more or less commonly around Cairns and Babinda:—(1) *Sida cordifolia* (see plate), (2) *S. acuta,* (3) *S. retusa,* (4) *Crothlaria* sp., (5) *Passiflora alba,* &c.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

Farmers requiring additional information on any of the subjects mentioned below—particularly with regard to methods of controlling insect pests of cane—are invited to consult the Entomologist, either by 'phone (95 Gordonvale), or by letter addressed Meringa Private Bag, Cairns. Concerted action taken at the right time will often go far towards minimising injuries caused by our more serious cane pests, and whilst not unduly trespassing upon daily activities of the grower would tend to benefit him financially.

EFFICIENT CONTROL OF THE WEEVIL BORER.

It is gratifying to be able to report that injuries to cane sticks from attacks of this beetle have now been reduced to a minimum owing to the good work of the tachinid fly parasite (*Ceromasis sphenophori* Vill.). About the beginning of this year (1930) growers ceased to apply for consignments, so that the work of rearing specimens for liberation amongst borer-infested cane was discontinued for a time. During the last couple of months, however, a few requests have come to hand from certain localities where little or no attempt has been made to establish these useful fly parasites, and we have, accordingly, decided to again take up the work of breeding additional specimens to meet such requirements. Many farmers have not yet fully realised the value of biological control work, for on selections where this insect succeeded in gaining a footing in the past it too often happened that no provision was made by the owner for its future breeding. Indiscriminate burning of all the cane during the cutting season operates either as a severe check on the multiplication of tachinid flies, or by exterminating them altogether, and necessitates the work of liberating additional consignments being done all over again. In the meantime, before specimens of this insect become available for distribution, those troubled by beetle-borer cannot do better than to trap as many of the adult weevils as possible (see "Queensland Agricultural Journal," vol. xxxi., page 202).

ENLISTING THE HELP OF USEFUL INSECTS.

Among those insects which we recognise as being friends of the canegrower none, perhaps, are more serviceable or interesting than our common species of digger-wasps, whose maggots are nourished by the life-juices of various root-eating grubs.

Our two best known species of these so-called flower-wasps are *Campsomeris tasmaniensis* Sauss. and *C. radula* Fabr., the females of which are large hairy wasps about 1¼ inches in length, and ornamented with conspicuous bands of orange-yellow and black. Their white maggot-shaped inactive larvæ, about an inch long, are often found in plough furrows attached to dead or dying cane-grubs. These spin cocoons of a dark reddish-brown colour, composed of silk hardened to the consistency of stiff paper, from which untimately emerges the adult digger-wasp. A third, but less plentiful species named *Scolia formosa* Guer., has just been described by the writer as being parasitic on grubs of the greyback, and those of two additional cane-beetles of primary importance.

FLOWERS WHICH ATTRACT DIGGER-WASPS.

Our farmers should do their best to encourage these useful parasites to take up their quarters on land adjoining canefields which chance to be very subject to grub attack. This can only be done by preserving or growing purposely on such areas those honey-bearing flowers which are known to be the food-plants of such wasps. The common weeds *Sida cordifolia* and *S. acuta* happen to be great favourites in this respect, while amongst other attractive flowers may be mentioned *Passiflora alba, Sida retusa, Antigonun* sp., &c.

On cane farms where such flowers are entirely absent it would be a good plan to sow one or more favourite species on small patches of open ground here and there around the plantation, close to or immediately adjoining the headlands.

Growers desiring suitable seed can obtain same free of cost by applying to the Entomologist at Meringa.

THE SUGAR INDUSTRY.

COMMONWEALTH COMMITTEE OF INQUIRY.

MR. EASTERBY'S EVIDENCE.

The following statement by the Director of Sugar Experiment Stations, Mr. H. T. Easterby, was submitted as evidence before the Commonwealth Committee of Inquiry into the Sugar Industry, in the course of its recent sittings in Brisbane.

CONSIDERING the immense importance of the sugar industry to Australia as a whole, in even one direction—that of developing and settling Northern Australia, apart from its economic value to the Commonwealth—it is extremely difficult to understand the hostile attitude adopted by many people in the Southern States. The idea present in many of their minds appears to be that sugar-growing is a highly pampered industry in which "sugar barons, large planters, and wealthy sugar interests" derive enormous profits. As a matter of hard fact, sugar-growing in Queensland is carried on by between 7,000 and 8,000 small farmers, quite a large proportion of whom have a hard struggle to get on. The average acreage of cane in Queensland is 40, while in the more southern part of Queensland it varies from 8 to 29 acres. For many years past the cane farmer has had to struggle against the high costs of production, insect pests, diseases, cyclones, frosts, floods, droughts, and enhanced prices for all the goods he uses. During the war period the industry supplied sugar at very much lower prices than were being obtained in other countries where the huge price charged for sugar enabled the industry to build up large reserves to meet bad times later on. When an application was made on behalf of Queensland, in 1914, to the Interstate Commission for consideration, it was postponed on the grounds that the war was sufficient protection in itself, and they further stated that "the sugar-growers would have the market of Australia entirely to themselves for the next two years." This was poor consolation to the sugar-growers at a time when sugar values in all parts of world, except Australia, were increasing rapidly. No benefit, therefore, came to the Australian sugar producer, either from the effects of the war on the European crops of beet sugar or from the fact that he did have the Australian market all to himself. Better prices ruled shortly after, because the Commonwealth Government recognised that the industry was not being treated fairly, but they were in many instances counteracted by industrial difficulties in the Southern States which held up supplies of bags and lime, and the conveyance of raw sugar to the refineries, and in Queensland itself, with serious trouble in the transport services, both on land and sea.

War Time Sacrifices.

Australian consumers and manufacturers profited at the expense of the industry for many years in obtaining cheap sugar while the rest of the world was paying enormous prices——up to 1s. 6d. per lb. It was always anticipated that owing to this fact, and that the sugar-grower never asked for world's parity during the war, that he would be allowed fair treatment from the Commonwealth when the price of sugar was being considered.

The Industry of Vital Economic Importance.

From the standpoint of economics, the Queensland sugar industry is of vital importance to Australia, especially in the difficult times that are now ahead of the nation. Supposing there were no Australian sugar industry, we would have to face a bill for millions of pounds to purchase sugar overseas, and to pay the high rate of exchange now charged, to say nothing of the employment now provided by, and the value of the machinery, buildings, and land used in the industry.

It has been shown over and over again that of all the commodities in common use sugar has increased in price the least of all. As the sugar industry has been influenced by the same laws which govern the higher costs of all other foodstuffs, it is extremely difficult to understand why the foodstuff sugar is invariably selected for attack. Butter, which in 1929 showed an increase of 91.2 per cent. over the price in 1914, is never challenged, though in its manufacture nothing like the same amount of labour is employed, nor does it serve the purpose of peopling the empty spaces of the North.

The White Australia Doctrine.

The only industry that can profitably be carried on along the northern coast of Queensland is that of sugar; this has been proved over and over again. When the White Australia policy was adopted, the Commonwealth Parliament decided that the labour employed must be white, and that meant wages, hours, and conditions must be up to the standard. In 1900 practically all the sugar-cane was grown by coloured labour. The Federal Government recognised at the time that it must make the sugar industry sufficiently profitable to render it possible for growers to engage white labour on their farms, though it was felt that it was a huge experiment, for up to that time no country in the world had ever attempted to grow cane by white labour. To do this the Commonwealth introduced the Excise Tariff Act at first, and an excise of £3 per ton on manufactured sugar was imposed with a rebate of £2 per ton on all sugar-cane delivered on which white labour only had been employed. In order to quicken up the substitution of white for coloured labour this was subsequently altered to a so-called "bounty" when £4 a ton excise was charged, of which £3 a ton was returned to white growers, and this lasted up till 1913, when it was abolished, white labour by that time growing practically all the cane.

Repeal of Federal "Bounty."

The Act for its repeal provided that the "bounty" should be abolished on condition that the Queensland Parliament introduced satisfactory legislation to safeguard the industry and provided for the employment of white labour. Accordingly legislation was passed by the Queensland Government (on the understanding that the excise on sugar would be abolished with the bounty), which provided that the miller should pay the whole of the amount he had been paying as excise to the Commonwealth Government to the grower. This meant that, in addition to the old rates of bounty, the white canegrower would receive 2s. a ton of cane which had previously been received by the Commonwealth Government, this being the sum equivalent to the £1 excise retained. Another Act was passed making temporary provision with respect to the rates of wages and conditions of employment in the sugar industry until such matters were dealt with by awards of the Industrial Court. The rates of wages then laid down and the conditions were those specified in the Commonwealth Act of 1912. A third Act was for the purpose of prohibiting certain types of labour in the field, and its object was to shut out coloured labour or aliens, as might be required. This was not to apply to nations such as Italy, Russia, and others where treaties existed.

The Commonwealth Government being satisfied with this legislation issued a proclamation in July, 1913, abolishing the Sugar Bounty and Excise Act. The conditions as to price lasted until the constitution of the Cane Prices Board in 1915, which then fixed the prices to be paid for cane on its sugar contents.

The so-called "bounty," in any event, was only a rebate out of excise collected, so that the Sugar Bounty Act passed by the Commonwealth Government as part of the White Australia policy did not cost the people a penny; indeed, it was estimated it put £2,000,000 into the Commonwealth Treasury.

Settlement and Defence of Tropical Regions.

The Federal Royal Commission on the sugar industry, which sat in 1912, said, among other wise things, that "if the ideal of a 'White Australia' is to become an enduring actuality, some means must be discovered of establishing industries within the tropical regions, and that the ultimate—and in our opinion the effective—justification of the protection of the sugar industry lies beyond questions of industry or wealth protection—it must be sought in the very existence of Australia as a nation. So long as these regions are unoccupied they are an invitation to invasion, as well as a source of strategic weakness. While the wide divergencies of opinion which exist to-day with respect to the relation of public control to the sugar industry are often the result of mere ignorance of essential data, they are still more frequently the result of the failure to outgrow ideas, opinions, or policies which belong to the limited outlook of pre-Federal days. The problem of the sugar industry to-day is not, save in subordinate respects, a problem of industry, of wealth, or of production; it is primarily and essentially a problem of settlement and defence."

These remarks are as vitally applicable to-day as they were when they were written. This statement received ample support during the war, when the enlistment of men from the sugar districts was said to be the highest in Australia—viz., one in eight of the population of North Queensland.

A Small Farmer's Industry.

The sugar industry in Queensland as it is carried on to-day is essentially a small farmers' industry, and this is of the greatest advantage in settling a virile, energetic race in the tropical part of Australia as free men with a personal interest in their own lands. These farmers are the hardest workers we have. I, personally, think it will be found that the cane farmers, taken as a class, are no more prosperous than any other class of agriculturist, certainly not nearly so prosperous as many Victorian wheat farmers. Many of them are indebted to storekeepers, banks, and mills for financial aid. I have had thirty-two years' experience in the sugar industry, and during that time have been moving through the sugar districts and meeting cane farmers. My experience leads me to say emphatically that the majority of sugar-cane farmers are hard working men of small resources doing their best to improve their farms, and those of them that had to clear dense jungle and carve out a home for themselves and families in the tropical heat of North Queensland are deserving of the highest consideration and respect. It has been no small matter to leave the sheltered conditions of established communities and take up the work of making a cane farm, and by doing so adding to the wealth of Australia. Nor must the part played by the wives of these settlers be overlooked. It has been said "The white woman is rendering her tribute in populating and settling the North which commands the greatest praise." A woman who has to cook in a kitchen where the summer temperature is often over 100 degrees, under corrugated iron, demands the utmost sympathy, and many of our women of the North are called on to do this and even to bear harder burdens in the making of a home. A trip away from these conditions to the cooler South is essential at least every two years.

The Value of the Industry to Australia.

As giving some indication of the value of the industry to Australia, the following may be cited:—

The sugar industry employs over 20,000 men in the fields, mills, and refineries. Directly and indirectly it gives employment to 100,000 persons. Trains and steamers are employed in carrying thousands of tons of raw sugar to the Southern refineries and bringing back freight such as farm implements, mill supplies, jam, clothing, boots, &c., to supply the numerous sugar producers and wage-earners, as well as the population of the coastal towns in Queensland dependent on the industry. The Queensland sugar-mills also provide a good deal of work for the foundries of the Southern cities, and provide work and capital at the refineries in Sydney, Melbourne, Adelaide, and Perth. The sugar industry combines agriculture and manufacture, and as such affords a large market for goods of Australian manufacture.

The wages paid for labour in the Queensland sugar industry amount to £6,000,000, and no agricultural industry in Australia employs so much manual labour. This distribution of wealth, but for the Australian industry, would go to foreign countries which take little or nothing from us in the way of exports.

The industry has increased the population in the Herbert electorate (which stretches from Mackay to Thursday Island) by over 40 per cent. in recent years. Large towns and cities, such as Cairns, Innisfail, Ingham, Ayr, Mackay, and Bundaberg, are almost entirely supported by the industry, while other townships are absolutely dependent upon it. The capital invested is considered to be in the region of £30,000,000.

Many fine townships in Queensland are due entirely to the sugar industry. Take the case of the erection of the Tully mill alone. A few years ago where the township now stands there was nothing but impenetrable jungle. With the building of the mill the whole face of the country was changed, and a town with all the adjuncts of civilisation, such as churches, hospital, cinemas, post office, telephones, and schools, has now taken the place of dense jungle. Babinda and South Johnstone townships were built in similar circumstances and surroundings.

A White Man's Industry.

The sugar industry enables Australians to live as white men in the tropical regions, and it is now known that medical men consider a healthy and vigorous stock can be raised in North Queensland. Take away the sugar industry and what will happen to all that has been accomplished in settling this country and building cities? Its wealth of small farms will revert to jungle, and the probable incursion of other races, because we would not be effectively making use of this great territory. The responsibility is with Australia. As the Federal Royal Commission pointed out: "A white community which prefers to grow its own sugar in its own territory with white

labour must face the responsibility of making good the increased cost of production under the higher standard of living and reward. Either the consumer or the taxpayer must pay.'' Sir Henry Jones, head of the great jam-making firm, in 1921, said: ''We are not up against the Australian sugar industry. We know quite well that we must pay a price that will enable the sugar to be grown by white labour, and we are quite willing to do this. In so far as the Australian market is concerned, it does not matter to us what price we pay for sugar.''

It must always be borne in mind that the sugar producer is not permitted to buy his labour in the cheapest market. The Commonwealth Government ordered as a matter of national policy that only white labour should be employed, and then for many years commanded the rate of wages that had to be paid. Later this was handed over to the State Arbitration Court by the Commonwealth when it abolished the excise on sugar.

Field and Factory Efficiency.

The efficiency of the industry at the present moment cannot be considered as other than good. The milling work is excellent, and Queensland holds the record of producing 1 ton of sugar from a lesser amount of cane than any other cane-producing country of the world. The following table shows the improvement in this respect since 1900:—

Year.	Tons of Cane Required to Make One Ton of Sugar of 94 net titre.
1900	10·09
1910	8·73
1920	8·00
1929	6·91

In the field the efficiency has also increased materially, particularly in the yield of sugar per acre. In 1900 the yield of sugar per acre was only 1.28 of 88 net titre sugar, while in 1929 it was 2.41 tons per acre of 94 net titre sugar. In the Ayr district, with irrigation, the yield of sugar per acre reaches 3.68 tons. In 1900 the total yield of 88 net titre sugar was 92,554 tons. In 1929 the yield of 94 net titre sugar was 518,516 tons. The acreage from which cane is crushed has just been trebled in this period, but the total yield of sugar is now over six times as great.

Comparisons with other Countries.

No comparisons can properly be made between the sugar industries in Java, Hawaii, and Australia, as conditions are so totally different. In Java only plant crops are grown, as after one crop of sugar-cane the land has to be returned to the native owner for the cultivation of native crops, such as rice and maize. Sugar-cane is only allowed once in three years, so that a legally enforced rotation becomes imperative. It is for this reason, combined with the intensive cultivation of small areas by hand labour, that the yield per acre is so high. It also means that the area of an estate is at least three times larger than its annual plantation.

There are about 900,000 unskilled labourers, mostly in the fields; children and women earn from 4d. to 6d. per day, and men from 10d. to 1s., all on piecework. When a native considers he has earned sufficient for his wants he will very often sit down for the rest of the day. This class of labour is mainly employed between April and October; they have other means of support during the months of November to March. In addition to this large mass of unskilled labour, the sugar industry in Java employs some 56,000 regular native employees, most of whom are more or less skilled, and are paid, according to their position, from 1s. to 7s. per day, the average running from 1s. to 2s. 6d. per day.

The price paid to the natives for leases and the forbidding of growing ratoon canes compel the plantations to get the highest possible yield of cane and sugar per acre, and for this reason the cultivation has necessarily to be of the most intensive character. The intensive cultivation is made easy for the sugar planter in Java because of the abundant and cheap supply of labour; hence the tillage operation is carried out almost entirely by hand, and planters say that hand cultivation is cheaper for them than mechanical cultivation.

As far as the culture of sugar-cane is concerned, the conditions in Queensland and Java are so radically different that it would be impossible to apply Java methods of cane culture to Queensland. As a matter of fact, cane culture in Java is not "agriculture," but has been aptly described as "horticulture."

Imagine our farmers digging all the cane drills in a field and neatly piling the clods at the sides. Imagine their wives and children planting the cane and irrigating by pouring pails of water over the plants by hand from the neighbouring irrigating ditches and making holes and pouring carefully measured spoons of fertiliser against each stool. Imagine the different hillings up, and the care taken in the final hilling up, when the trash is pulled off the cane and the earth fitted closely up to and between the stools, all by hand labour. Imagine all these operations which actually take place in Java, and then ask: Would it be possible to carry them out in Queensland? Cane so grown in Java is on an immense number of small areas.

The Sugar Experiment Station in Java is acknowledged to be the finest in the world. It is the property of the General Syndicate of Sugar Manufacturers, and possesses its own governing board and its own revenue. The annual contribution of the sugar factories is at the present time equal to about 4s. 8d. per acre, the revenue amounting to more than £116,000 per annum.

The permanent staff of this Java Experiment Station at the present time consists of about 45 Europeans, 10 Chinese, and 250 natives, in addition to which there are 15 European local agents in the Extension Service of the Agricultural Branch. There are 34 houses for the European staff, and 8 of the 15 houses occupied by the Extension staff are also the property of the station.

The irrigation works in Java are of great magnitude, and the waters are rich in a silt containing potash and phosphoric acid, stated by Prinsen Geerligs to be quite sufficient for the cane crops, so that only nitrogenous manures are required.

In Hawaii, which leads the world in sugar production per acre, enormous sums are spent in irrigation and manures. The plantations and mills are all in the hands of large companies who are able to spend unlimited amounts of capital to secure results. Moreover, the tons of sugar produced are what are known as short tons, and the crops take practically eighteen months to two years to grow, as compared with twelve months' cane in Queensland, and the yields from the non-irrigated areas are not greater than in Queensland when this is taken into consideration.

Efficiency cannot be measured by comparison with other countries. Is our own industry efficient when taken in the light of its conditions and surroundings? I personally consider that it is, and by this I would not be understood to say there is no room for improvement along given lines, but this improvement is gradually being made and will come more to the front as scientific lines of teaching are followed; and our farmers are showing great aptitude in adopting such lessons.

Queensland in a Leading Position.

In the use of up-to-date farming machinery the Queensland sugar industry is in a leading position, and this is generally recognised by other cane-growing countries, who have frequently sent their representatives here to pick up knowldge on cane-farming implements, and have made many purchases of our machinery, all of which is good for the Australian manufacturer, who has at all times shown great readiness to manufacture special implements for cane cultivation, and to adopt suggestions made at different times for their improvement. It can be safely affirmed that in implements for the tillage of sugar-cane Australia leads the world.

The following extracts from reports made by two overseas visitors to the Queensland canefields are well worth quoting as showing the opinions formed by quite independent men on the Queensland sugar industry:—

Mr. L. D. Larsen, manager for the Kilanea Sugar Plantation, Hawaii, after attending the meeting of the International Society of Sugar Technologists in Java last year, spent some few weeks in a round of visits to some of our Queensland districts, including Bundaberg, Mackay, and the Burdekin, after which he wrote:—

"I have been travelling over four months now and have looked over the sugar industries of Formosa, the Philippines, Java, and Queensland. Aside from a general survey of the industry and attending the Sugar Congress in Java, I have been looking more particularly for methods and devices that may be of practical value in Hawaii for saving labour and reducing costs.

"From this latter point of view my trip through Queensland has been by far the most profitable. The other countries visited, while intensely interesting, had conditions that were less applicable to our own. The low price of labour in these countries made labour saving of minor importance, and as a consequence they were

not rich in labour-saving devices. In Queensland, where the cost of agricultural labour is higher than anywhere else in the world, employers of labour are bound to pay special attention to labour economy, and, as was to be expected, I found my richest territory in this respect here.

"Although I visited several of the mills, my attention was concentrated principally on the field, where I was rewarded by finding several interesting developments for labour economy. The most outstanding of these were as follows:—

1. The general practice of machine planting.
2. The development of new and original implements for inter-row cultivation.
3. The use of machines for applying fertilisers.
4. The development of machines for weeding in the cane-row.
5. The interest and earnest endeavours that are being made to develop harvesting machines.

"While the latter is not yet a full-fledged practical success, it has shown excellent possibilities, and I believe has every chance of being a practical success in the immediate future under conditions obtaining in Queensland.

"I do not intend going into a detailed description of these various implements and their uses at the present time; but I must stop to compliment the Queensland agriculturists on their progressiveness and originality along these lines. Two of these implements—the roto-cultivator and the spinwheel-weeder—are distinctly original types, while a third—the rake-cultivator—and the scratcher are adaptations of an old-type farm implement to a new use.

"The cane planter is also a distinctly Queensland product, and is decidedly simpler and more efficient than the planter occasionally used in Hawaii.

"In travelling over Queensland I was particularly struck by the high degree of intelligence and interest shown by the labourers themselves in the work, and in the sugar industry as a whole. I talked with many of them in the fields and in the hotels, and I always found them anxious to talk about field operations, implements, the industry as a whole, its future—and the Government.

"The farmers also seemed very intelligent as a class, and, with a few individual exceptions, practised clean and intelligent culture. The canefields as a whole were cleaner and better than one is led to believe from the average yield-average.

"Conditions in Queensland are unique in the sugar world on account of the high wages paid for field labour and the use of white labour. However, I believe the situation is being met intelligently by employers as well as employees. I did not find the tendency on the part of labour to shirk and hold back the job that is evidenced in some other highly organised labour communities. I studied men employed at task labour and at day labour, and believe their application and efficiency are decidedly superior to that of our labour in Hawaii or the other sugar countries visited. The relations between the plantation manager and his employees seemed decidedly pleasant in the cases I had opportunity to notice, and I believe the plantation managers are to be commended for the way they have met and adapted themselves to conditions of labour and to Government regulations that at best must be arduous and irritating. Impossible as these conditions seem to one accustomed to the use of coloured labour, they are taken in Queensland as part of the business, much as we in other countries look upon taxes and unfavourable weather."

A South African Visitor's Impressions.

Mr. T. W. Wickes, an engineer prominently identified with the South African sugar industry, said:—

"Amongst the most attractive sights to a visitor from abroad to witness is that to stand by watching a gang of your Australian stalwarts—viz., your cane-cutters—at work. The physique of the men whom I had the pleasure of seeing at work might well make a strapping Zulu 'boy' envious, and one realises therefrom the remarkably healthy conditions of Queensland, despite the tropical heat. Seeing these men at work also is, I should imagine, the finest argument in favour of contract or piecework, which at times is a bone of contention."

Cane Cultivation.

With respect to the use of fertilisers, the quantity applied per acre far exceeds that applied in the Southern States, as sugar-cane demands much heavier dressings.

The amount of cultivation required for cane as compared with wheat-growing, for instance, is considerably greater. In wheat-growing the land does not require much

more than shallow ploughing, which can be carried out with gang ploughs covering a wide extent of land, whereas cane land must be deeply ploughed and worked and single drills drawn for the plants. Wheat is seeded by machines several rows at a time, while cane plants have to be set out in single furrows. Fertilisers, too, can be applied to wheat in several drills at a time, but to cane only in the single drills. This naturally renders operations in the cultivation of cane much more costly than wheat or cereal growing.

Non-British Labour.

Evidence will be given by others as to the incidence of non-British cane growers and cutters. It may be remarked, however, that I found, when paying a visit to the beet sugar factory at Maffra, in Victoria, in 1927, there were 40 per cent. of Italians employed in the field, while in the Queensland industry there are under 10 per cent.

The Economic Position.

The low price of sugar overseas at the present moment is caused by over-production, assisted by a lower consumption. There is at the present time a movement on foot to deal with the problems of over-production and to restrict the output of sugar by foreign producing countries; and if this is done the price will materially advance.

British Preference.

If Great Britain, as she has done in the past, thinks it wise to preserve the sugar industry in her dominions by granting preference, surely Australia will be able to see the wisdom of maintaining its sugar industry. The sale of sugar from Australia overseas is at the present time of immense value to this country in increasing the Australian revenue paid by a creditor nation and by compensating for adverse trade balances. At a time like the present, every pound that comes into Australia for foods produced here is of the greatest importance. As far as the price of sugar in Australia is concerned, the weekly household expenditure on sugar is less than on any other leading food commodity. If the export of sugar is to be sacrificed, it will be Australia as a whole that will suffer, not alone in the loss of the revenue from sending sugar overseas, but in the further unemployment of a large number of men.

National Security.

There is another factor to be considered. Supposing an enemy's navy blocked the sea routes, our existence might depend on the production of power alcohol from sugar-cane. In the larger interests of Australia, the Southern people must take a long view of the sugar industry; they should not begrudge a few pence per week for their own maintenance and security. The people engaged in the sugar industry are a most effective garrison for the North.

I have not touched on land prices or detailed economic figures, as these will be supplied by others and do not come within my province.

SALE OF HOME HILL STATE FARM.

Attention is directed to an advertisement on another page, inviting tenders for the purchase of the State Farm at Home Hill. This farm is situated on the Inkerman Irrigation Area, Burdekin River. All improvements, including 34 acres under sugar-cane, will be offered with the farm as a going concern. The farm has an area of 206 acres of freehold land with a cane assignment of 72 acres gross, 54 acres net. Tenders close with the Secretary of Public Lands, Brisbane, at noon on Saturday, 17th January, 1931.

THE BROWN CUTWORM (*Euxoa radians* Guen.).

By G. A. CURRIE, B.Sc.

PART V.

OECOLOGICAL DISCUSSION.

IN the discussion which follows an attempt will be made to analyse some of the factors concerned in the survival from year to year, and the sporadic outbreaks of *Euxoa radians* as a severe pest.

The number of records of outbreaks in the past is small, and together with the experience of the last three seasons is only sufficient to formulate theories, the proof or refutation of which must lie in the future, after a number of years of observation and recording.

A great part of the life of *Euxoa radians* is spent in the soil. There the egg is laid in the loose surface, the caterpillar spends its life on or in the soil, the pupa lies therein, and even the adult moth with the gift of flight never leaves the soil for any protracted period.

With such an intimate connection between soil and insect it is not surprising that the soil conditions have a very great effect on the rate of development, structure, incidence, and survival of the object of this investigation.

Certain modifications in the structure of the larva have direct relation to the soil-haunting habit of life, so, although already touched on in the general description of the stages, they will be enumerated here.

The burrowing habit (and it is also true of larvæ boring in leaves or stems of plants) has caused the mouth parts to migrate cephalad. This becomes progressively more marked in *Euxoa radians* with each succeeding instar.

The measure of this forward and upward migration of the mouth parts is indicated by the epicranial index which has already been given for each instar. The first instar larva (Plate V., fig. 5), with its relatively long epicranial stem, has the mouth parts directed somewhat downward, while the sixth instar larva (Plate V., fig. 6), in which the epicranial stem has been reduced to a minimum, has the mouth parts directed forwards.

The subterranean habit requires no spinning, so the spinnerets of all stages are of a very reduced type. As a strong contrast between the downward-directed mouth parts of an aerial type of caterpillar and the forward-directed type of the subterranean species, the head of *Remigea frugalis* (Plate VI., fig. 3) is figured. This caterpillar lives amongst grasses, climbing up the stems and never entering the soil even to pupate; its epicranial stem is very long.

The spinneret of this insect, which spins a cocoon before pupation, is also in strong contrast with the reduced type of *Euxoa radians*, which pupates in an earthen cell. (Plate VII., figs. 1-4.)

The reduction of the epicranial stem in *Euxoa radians*, sixth instar, is the greatest yet noticed in any noctuid larva, although that of *Agrotis ypsilon* (Plate VI., fig. 4) is nearly as great.

There is comparatively little pigment in the skin of *Euxoa radians* larvæ, and this may be regarded from two angles:—

(1) It may be considered to be a positive adaptation to life in the soil through the loss of pigment; and

(2) It may be regarded as a negative adaptation to such a life through the non-development of pigment.

The choice of alternatives lies in the view taken as to the type of ancestor from which this cutworm is descended.

The striking nakedness of cutworm larvæ seems to bear some relation to their underground habits, and in the species under consideration there is a considerable decrease in the relative size of the setæ between the first instar which is not subterranean, and the last instar which is almost wholly so.

Whereas in the economy of many caterpillars which are surface dwellers, e.g., *Heliothis obsoleta,* the tachinid flies are important controls, this does not seem to be so true of *Euxoa radians.* Tachinids are usually active only during the day so that the nocturnal cutworms escape them under normal conditions. This applies, of course, to tachinids laying eggs directly on the caterpillars. When dull weather comes, or any condition which causes the cutworms to move about on the surface during the day, then the tachinid flies may take some toll of them. Heavy rain may cause the larvæ to come to the surface and so expose themselves to many dangers from parasites and predators. In the case of the North American pale western cutworm *Porosagrotis orthogonia* it has been stated[17] that the number of wet days in May and June can be used in forecasting outbreaks. If more than fifteen days in May and June are wet there will be a big decrease in the following year's infestation. If less than ten wet days occur in May and June the following year will probably see a heavy attack. This reaction to rainfall is stated to be due to the fact that wet weather causes the cutworms to feed above ground on the upper parts of grasses, against their normal habit of cutworm feeding. On the upper parts of the grass are laid eggs of parasitic tachinids, which being ingested, develop into larvæ and cause the destruction of the cutworm.[18] Other parasites and predators can attack them when the rain has brought them above ground, hence the correlation between wet days in May and June and the incidence of the attack in the following year.

It is clear that living in the soil as they do the larval and pupal stages of cutworms are to a great extent at the mercy of soil conditions. Some of the factors operating on them can now be considered.

Environmental Factors.

Townsend[19] divides the insect environments into media, factors, and controls.

The primary media are air, water, and soil.

The factors are actual forces operating on the organism in the media, as heat, sunlight, rainfall, humidity, &c.

The controls are climatic and topographic, as latitude, altitude, seasons of years, &c.

Accepting this system of oecological analysis, the medium in the case of all immature stages of *Euxoa radians* is the soil.

The chief factors and controls which affect it in the soil are soil temperature, rainfall, atmospheric humidity, soil texture, soil moisture, vegetative cover, food supply, predators, parasites and diseases. These will be seen to be interdependent and the four fundamental ones would appear to be soil texture, soil temperature, rainfall (which controls soil moisture and vegetation to a large extent), heat, and natural enemies.

Soil Texture.

This factor is important from two points of view in connection with cutworm survival:—

(1) Only in loose soils will the moth lay eggs and the larvæ live and develop.

(2) Only fairly loose soils have the water holding and air holding powers which help survival of the cutworm larvæ. Heavy soils tend to become waterlogged when wet and caked when dry, and in either case are badly aërated.

These two points are concerned with soils in a state of nature, but cultivation can alter the mechanical condition of soils, so that a soil even if naturally heavy, becomes loose and well aërated with proper tillage. This extends the range of situations suitable to the survival and increase of cutworms, and at the same time renders vulnerable the crops planted thereon.

The chemistry of the soil has a direct effect on soil texture, especially in relation to colloidal substances; and on plant growth in the matter of "manurial salts" and hydrogen ion concentration. Apart from these indirect effects, soil chemistry has not been seen to have any direct effect on the development or survival of the immature stages of *Euxoa radians*.

Soil Temperature.

In the section dealing with temperature relations, the effect of temperature on the rate of development of cutworms has been fully dealt with. The effect of very high soil temperatures on the eggs has already been noted and high temperatures may have a considerable influence in the control of the other life stages.

Rainfall.

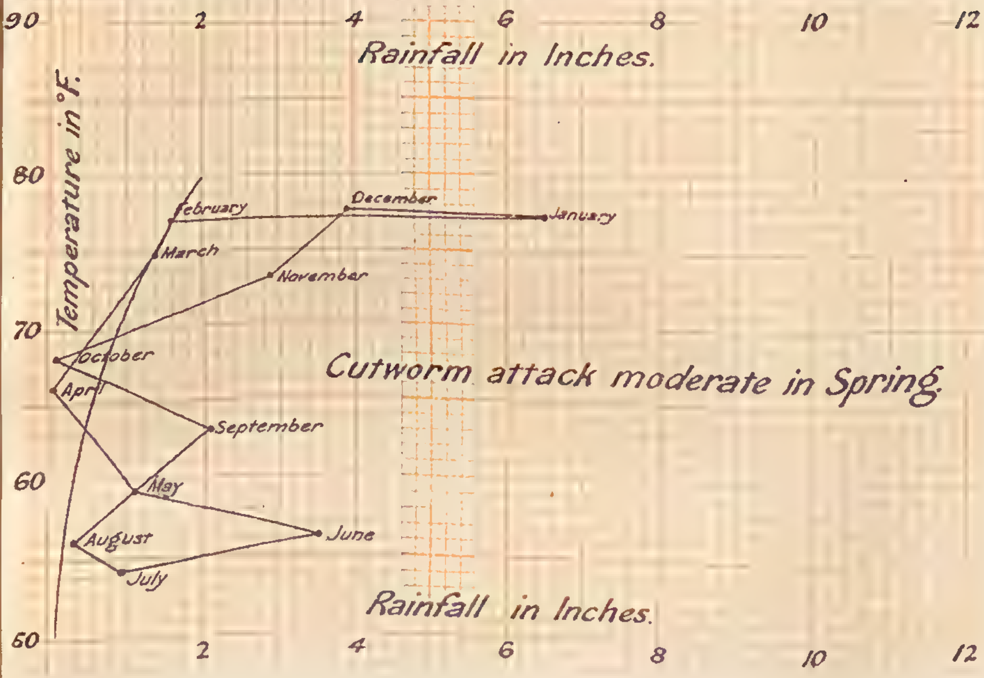
The amount and distribution of rainfall throughout the year affects the cutworms indirectly through its effect on food plants and natural enemies, and directly by flooding or soaking the soil and controlling the soil moisture at any period.

The soil moisture, at different periods af the year is a critical factor in deciding whether there will be an increase or decrease in cutworms. The effect of this factor in controlling *Porosagrotis orthogonia* indirectly through its parasites has already been noticed.

Cook[20] has studied the same species from the point of view of optimum soil moisture for survival and multiplication. His results are shown in a "climograph curve" which is based on soil moisture conditions obtaining at stations where cutworm damage was severe, and assumes that at different temperatures there is a soil moisture content which is the optimum for the species. The curve shows the optimum humidity at different temperatures for cutworm survival.

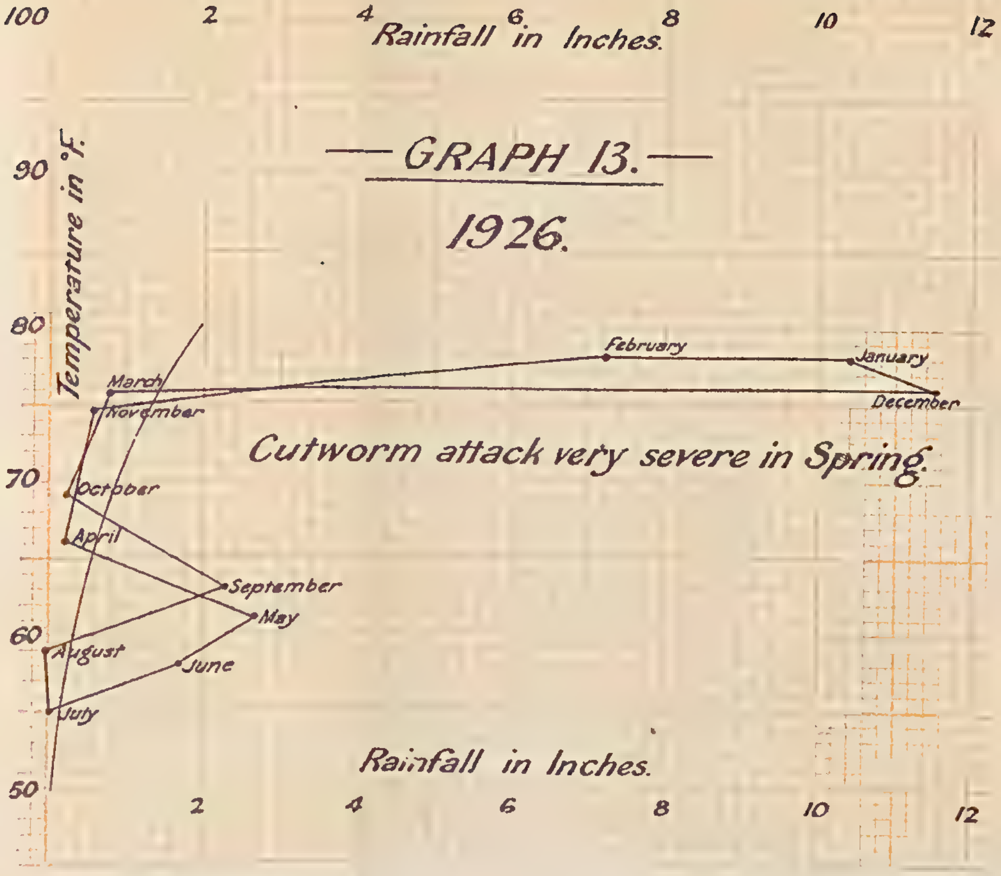
GRAPH 12.

1925.



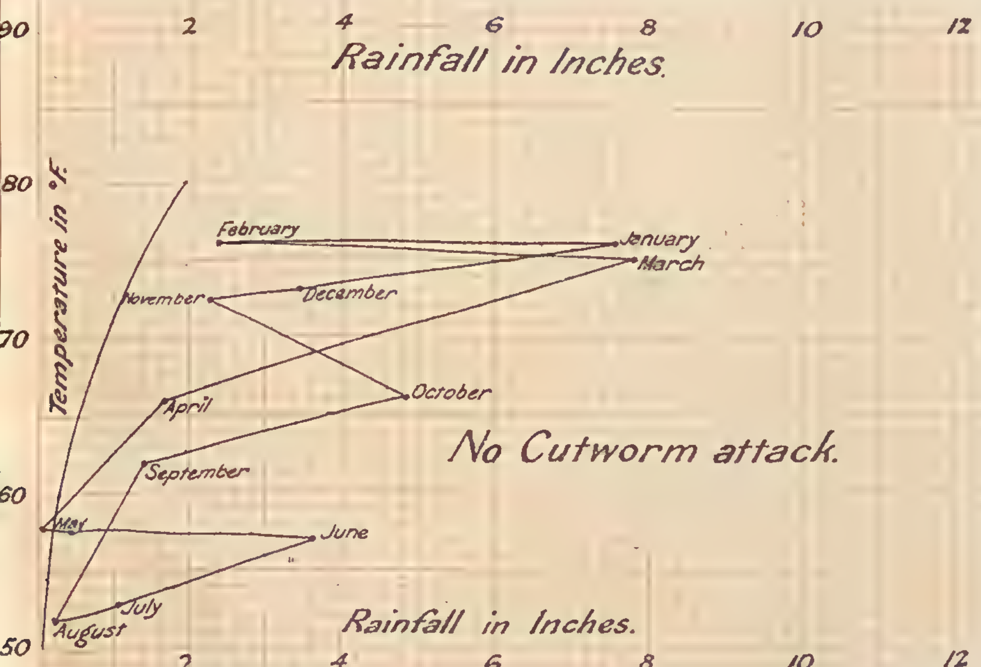
GRAPH 13.

1926.



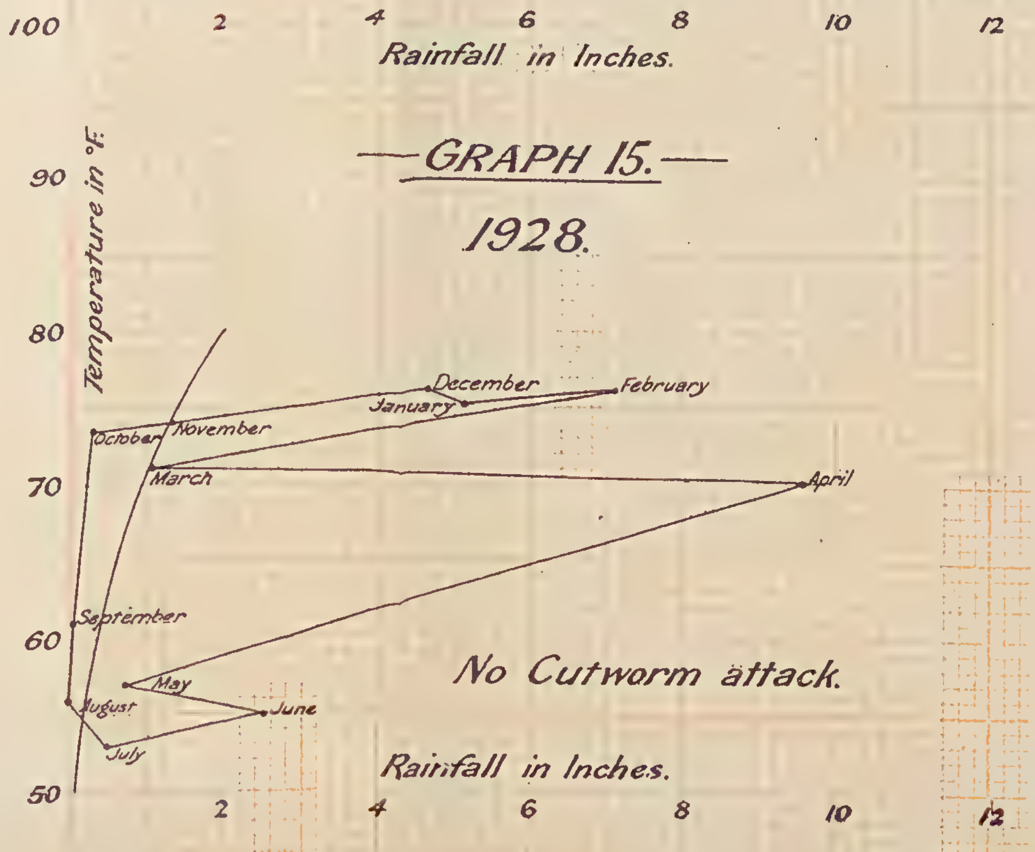
GRAPH 14.

1927.



GRAPH 15.

1928.



Climographs for Cotton Research Station, Biloela.
in relation to damage by the cutworm *Euxoa radians* Guen

The climograph for any place for one year is got by plotting the figures for temperature and precipitation on a graph for which these factors form the axes, and then connecting the points for successive months by a line to form a closed figure. When the shape of the climograph (closed figure) of a district approximates to the shape of the "Climograph curve," then cutworm damage should theoretically be great for that district.

Using the weather data from the Cotton Research Farm, Biloela, for the four years, 1925-1928, the climographs shown in Graphs 12, 13, 14, and 15 have been constructed.

The year 1925 had a slight attack of cutworms in October. The year 1926 saw a widespread and destructive attack in October with a less severe second attack in November, ending suddenly in December. In 1927 there was no serious outbreak of cutworms reported in the cotton areas, and the same was true for the spring of 1928.

Examining the 1926 figure and remembering that *Euxoa radians* breeds continuously throughout the year except in winter, in those districts where frosts are common, the following story for that year of serious damage by cutworms can be read:—

High temperature and heavy rainfall in January and February would probably reduce the summer brood to small numbers, and survival would be possible only in favoured situations in well drained soils, or in locations where rainfall had been less heavy.

A dry autumn in March and April would favour the breeding up of the cutworm to larger numbers, and food supply would be plentiful after the bounteous rains of summer. Accordingly a large number of larvæ would reach maturity and enter the soil to pupate in May. The cool, dry winter would favour survival of the pupæ and these would emerge in large numbers over a short period with the rising temperatures and spring rains of September.

The story from this point is well known, for a heavy emergence of cutworm moths was observed in early September. When the cotton seedlings came up in early October millions of larvæ attacked them with deadly effect. The dry weather continuing throughout October, November, and early December, favoured the survival of the pests which only succumbed finally to the drenching rains of mid-December.

In 1927 the heavy March rains prevented the autumn brood from becoming very large, and probably the cold rains in June were inimicable to the survival of the pupæ in the soil. No attack developed in the spring months and the rainfall of October carried the young cotton crop rapidly through the danger period without damage.

In the autumn of 1928 heavy and continuous rains in April suggested that few cutworms of the species under consideration would survive to pass through the winter. Accordingly it was predicted that no attack would take place in the spring. In spite of the fact that the spring months were dry and apparently favourable for an attack, none developed and cutworms were scarcer than at any time during the previous three seasons.

An arbitrary curve of optimum soil moisture conditions for the species, based on the 1926 climograph is drawn in on each of the climograph figures shown, so that a comparison can be made between that curve and climatic conditions prevailing during each year.

Where wide divergences from the general position of this curve are seen in the autumn, winter, and spring the suggestion is that soil moisture conditions were unfavourable to the survival or increase of the broods developing at that period.

Resistance to Submergence.

The danger of submergence in water for a longer or shorter period is always a present one with soil-haunting organisms. The length of time noctuid larvæ can be submerged and completely recover afterwards, has been suggested by Ripley[8] as a measure of the degree to which they have become adapted to the subterranean habit of life.

The application of this test to *Euxoa radians,* which is especially adapted to well-drained localities and fairly arid conditions, is of doubtful value. The following notes have, however, been made:—

(1) After twenty-four hours submergence larvæ twitched head and legs, but did not recover.

(2) After twenty hours submergence larvæ twitched head and body, but did not recover.

(3) After sixteen hours submergence larvæ twitched, some could roll up a little, but none recovered.

(4) After ten hours submergence some could roll up and crawl away, and one in ten recovered completely; the rest died.

(5) After eight hours submergence, 4 in 10 recovered completely; the rest died.

(6) After six hours submergence, 5 in 10 recovered completely.

(7) After one hour submergence, all recovered.

This resistance to submergence is very variable, and it was not considered of sufficient importance to experiment extensively with. One larva was submerged for a short period (ten minutes) and then taken out to recover, and then submerged again for a longer period (twenty minutes). This was repeated six times, increasing the submergence period each time, and then the larva submerged for twenty hours, when it recovered sufficiently to roll up and later to crawl away. This suggests that some form of resistance to submergence was developed in the individual larva, and it was noticed that it had ingested air into the gut after the third submergence, causing it to float on the surface of the water.

Resistance to Starvation.

The food supply of the larvæ may be cut off suddenly, as when a weedy fallow is ploughed. In such a case the larvæ do not die for some considerable time and may survive to attack seedlings which have come up after the cultivation.

In the laboratory small larvæ in the second and third instars were found to be able to survive for about ten days without food at temperatures about 60 deg. Fahr., but at higher temperatures they died off quickly. Larvæ in the fifth instar were found to survive without food for about five days at 78 deg. Fahr. and twenty-two days at 63 deg. Fahr. Larvæ deprived of food when about half way through the sixth instar remained for about ten days in the larval state and then succeeded in pupating, producing undersized pupæ.

Resistance to Cold.

Larvæ of different ages kept at freezing point could not feed and died after ten or eleven days continuous exposure. Pupæ were kept at freezing point for twelve days and then gradually warmed up to about 75 deg. Fahr., when they emerged normally as adult moths. It would appear that in Queensland cold is not likely to be a direct cause of death of *Euxoa radians,* as no period of continuous frost day and night is experienced in the State, nor is the soil subject to temperatures much below freezing point even on winter nights. It may, of course, be an indirect cause of death through the killing of host plants.

Reported Cutworm Outbreaks.

The following list of attacks by cutworms has been extracted from the yearly reports of the Department of Agriculture and Stock, Queensland, and from notes lent by courtesy of Field Assistants of the Agricultural Section:—

TABLE XIV.

REPORTED OUTBREAKS OF CUTWORMS IN QUEENSLAND.

Year.	Species.	Locality.	Crop Attacked.	Month.
1907	*Agrotis* sp.	Beenleigh	Vegetables . .	. .
1908	Ditto	Queensland generally . .	Lucerne . .	. .
1909	Ditto	Bowen	Tobacco . .	March
1909	Ditto	Bowenville	Vegetables . .	. .
1909	*Agrotis munda* (*Euxoa radians*)	Degilbo	Onions . .	November
1913	Ditto	Wootha	Onions . .	October
1915	Ditto	Wallumbilla	Potatoes . .	October
1915	Ditto	Stanthorpe	Vegetables . .	December
1915	*Agrotis* sp.	Atherton and Townsville . .	Maize . .	October and November
1915	Ditto	Mundubbera	Maize . .	October and November
1916	Ditto	Capella and Mungallala . .	Cotton . .	November
1917	Ditto	Cleveland	Marjoram . .	October and November
1922	Ditto	The Downs and Condamine	Cotton	October and November
1922	*Euxoa radians* Guen.	Dulacca and Miles	Cotton . .	October and November
1923	Ditto	Mulgeldie (light attack) . .	Cotton . .	October
1924	Ditto	Monal Creek (light attack)	Cotton . .	November
1925	Ditto	Biloela (medium attack) . .	Cotton . .	October
1926	Ditto	Biloela (heavy attack) . .	Cotton . .	October
1926	Ditto	Kilcoy	Maize . .	October
1926	Ditto	Coominya	Grape Vines	October
1926	Ditto	Mundubbera	Cotton . .	October
1927	Ditto	Monto (light attack) . .	Cotton . .	September

It was found on examination of weather records for the years of attack, that in all cases where *Euxoa radians* was the cutworm concerned, the period of attack was dry, and usually preceded by a dry period. The most serious and widespread attack recorded occurred in 1926. (See graph 13.) This was preceded by four dry years in which slight attacks occurred, so that the effect of a series of dry years appears to be cumulative.

The reported outbreaks of cutworms at Atherton and Townsville are interesting, as both these localities have a normal rainfall of about 50 inches yearly, and the year of damage, 1915, is referred to in the report of the Department of Agriculture and Stock as a "drought" year in the affected area. Normally it would seem that the heavy rainfall keeps the cutworms in check, but that in the dry year their destructive range approached the coastline more closely than usual, following their optimum rainfall conditions.

It must be remembered that near the coast in well-drained areas of suitable soil some damage is done every year by cutworms of the species under consideration, but the mass outbreaks occur only after periods of dry weather which have allowed them to breed up to large numbers, and during dry weather which permits their survival.

The rainfall area over which most serious attacks occur lies between the 20-inch and 60-inch isohyets, but that is because most of the crops which it attacks grow within those rainfall limits, not because the species does not occur elsewhere. The natural habitat extends into more arid regions where the yearly rainfall is from 15 inches upwards and, where the species is present, favourable conditions over a period permitting a series of broods to develop will always bring up the numbers to pest proportions. In dry areas where the food supply is not continuous *Euxoa radians* cannot survive.

The evidence available suggests that heavy outbreaks are the result of local increase of the pests during favourable periods rather than from mass invasions from distant areas.

Host Plants.

Being a drought resistant species it follows that the natural food plants of *Euxoa radians* should be xerophytic in type. The principle foodplant of the species is pigweed (*Portulacca oleracca*), a fleshy low-growing annual with a series of generations each year. The distribution of the insect in Queensland conforms to a considerable extent to that of the pigweed, the latter being xerophytic and cherzophytic in habit, extending from the coast to the western border of the State in favourable situations on waste or fallow lands.

In spring, various thistles and wild carrots coming up with the first rains, form the host plants of the species, and these are followed by pigweed which lasts through summer and autumn in most places right on to the winter period, when it is killed by the frosts. In the coastal areas, however, pigweed grows in a series of generations continuously right through the winter in sheltered spots and the breeding of *Euxoa radians* is also continuous.

The thistles (*Sonchus oleracea*) can tolerate fairly arid conditions owing to their deep tap roots, are succulent in growth, and it has already been noticed that the resistance to aridity of the cutworm is bound up with the presence of abundant succulent food.

In a general way pigweed grows on sandy soils in open spaces where it can compete successfully against the less drought resistant grasses, and this is exactly the situation favoured by the cutworm, so that the insect and plant localities bear a close relationship to each other.

In areas of high average rainfall (say over 40 inches) pigweed does not usually occur in large areas in the open bush, but is found mainly

in cultivated land. In such areas the principal breeding ground of the cutworm is cultivated land, so that perfectly clean cultivation of crops and fallows would act as a partial natural control of the numbers of cutworms. In drier areas, however, there are frequently thousands of acres of virgin bush covered in late spring, summer, and early autumn with a mass of pigweed. In such cases there is an unlimited food supply for the species to breed up on, so it cannot be argued that clean cultivation will control the incidence of the pest. It can be said, however, that clean cultivation will form a less desirable place for the moths to oviposit in than weedy fields.

Fortunately those localities where pigweed grows in large patches in the bush do not usually coincide with areas of agricultural land, but are mainly pastural, and being such, pigweed may form a fairly good grazing crop.

The following is a list of the host plants, both cultivated and wild, on which the cutworm has been seen to feed:—

TABLE XV.

HOST PLANTS OF *Agrotis radians* GUEN.

Family.	Common Name.	Scientific Name.
Ampellideæ	Grape vine	*Vitis vinifera*
Compositæ	Sow thistle	*Sonchus oleracea*
		Galinsoga parviflora
	Noogoora burr	*Xanthium strumarium*
Cruciferæ	Turnip	*Brassica rapa*
	Beetroot	*Beta vulgaris*
	Cabbage	*Brassica oleracea*
Gramineæ	Maize	*Zea mais*
	Wheat	*Triticum sativum*
	Oats	*Avena sativa*
	Sugar-cane	*Saccharum officinarum*
Labiatæ	Marjoram	*Origanum vulgare*
Leguminosæ	Peas	*Pisum sativum*
	Beans	*Phaseolus spp.*
	Lucerne	*Medicago sativa*
Lilliaceæ	Onions	*Allium cepa*
Malvaceæ	Cotton	*Gossypium spp.*
Papaveraceæ	Fumitory	*Fumaria parviflora*
Portulaccaceæ	Pigweed	*Portulacca oleracea*
Solanaceæ	Tobacco	*Nicotiana tabacum*
	Potato	*Solanum tuberosum*
	Tomato	*Lycopersicum esculentum*
Umbelliferæ	Carrot	*Daucus carota*
Zygophylleæ	Bullhead	*Tribulis terrestris*

There may be some chemical affinity between the various host plants of *Euxoa radians,* but they belong to widely separated families, and no apparent relation between them can be seen.

Prediction of Cutworm Outbreaks.

Coming now to the summing-up of the possibilities of predicting outbreaks of *Euxoa radians* it would be well to note the factors known, as against the factors unknown.

Hinds[21] summarises many of the difficulties in the way of prediction, but admits that "there are phases of insect multiplication studies to which the 'Theory of Probability' may be applied."

Widespread outbreaks of great intensity are rather rare, so that it is obvious that a special set of circumstances is necessary for an outbreak to occur. A table of the climatic factors considered to be favourable to development and multiplication, contrasted with factors unfavourable to these, is given below:—

TABLE XVI.

FAVOURABLE.	UNFAVOURABLE.
Summer.	
Suitable temperatures (see section on temperatures) for larval development and survival of all stages.	Unsuitable temperatures. Excessive heat
Moderate rains without excessive humidity.	Torrential rains and high atmospheric humidities.
Autumn.	
Temperatures decrease gradually, rainfall light.	Sudden early frosts, killing food plants.
Relative humidity moderate.	Heavy rainfall with excessive humidity.
Winter.	
Rainfall light.	Rainfall heavy.
Temperatures low and fairly regular.	Temperatures erratic with warm spells of humid weather.
Spring.	
Moderate early rains to bring up food plants followed by dry period.	No early rains followed by heavy late rains.
Temperatures rising steadily without late frosts.	Sudden late frosts.

In considering the unfavourable climatic conditions, it would be well to suggest the reason for their effect on the cutworms.

High Atmospheric Humidity.

Feeding on succulent food as it does, it is necessary that surplus water should be easily cleared from the system of the cutworm or a water content greater than the optimum will be developed. A dry air will carry off this surplus moisture and also reduce temperature by evaporation, whereas a humid air will not remove surplus water nor will it reduce temperature. A water content greater than the optimum will reduce metabolism and induce an unhealthy state prone to disease. If a high humidity be combined with a high temperature, then the case becomes critical, for the high temperature tends to accelerate metabolism and activity, while the presence of surplus water inhibits it. This leads to an unhealthy digestive system and to disease and death.

Excessive Rainfall.

Sandy soil can tolerate much rain without becoming sodden, but soils of a slightly heavier nature are apt to become sticky after heavy rain. This wetness not only hampers the cutworm's movements mechanically in the soil (young larvæ cannot survive in wet soil), but tends to clog up the spiracles, and in sticking to the skin prevents evaporation therefrom. It may be that heavy rains alter the chemical character of the host plants on which the larvæ are feeding and so indirectly affect them, but that is conjectural. Heavy and continuous rains then will restrict survival of cutworms to well-drained sandy localities.

Irregular Temperatures.

Sudden early frosts will kill host plants and so, indirectly, the cutworms, and so in autumn may reduce considerably the brood going into winter quarters. Unseasonable warmth and moisture during a

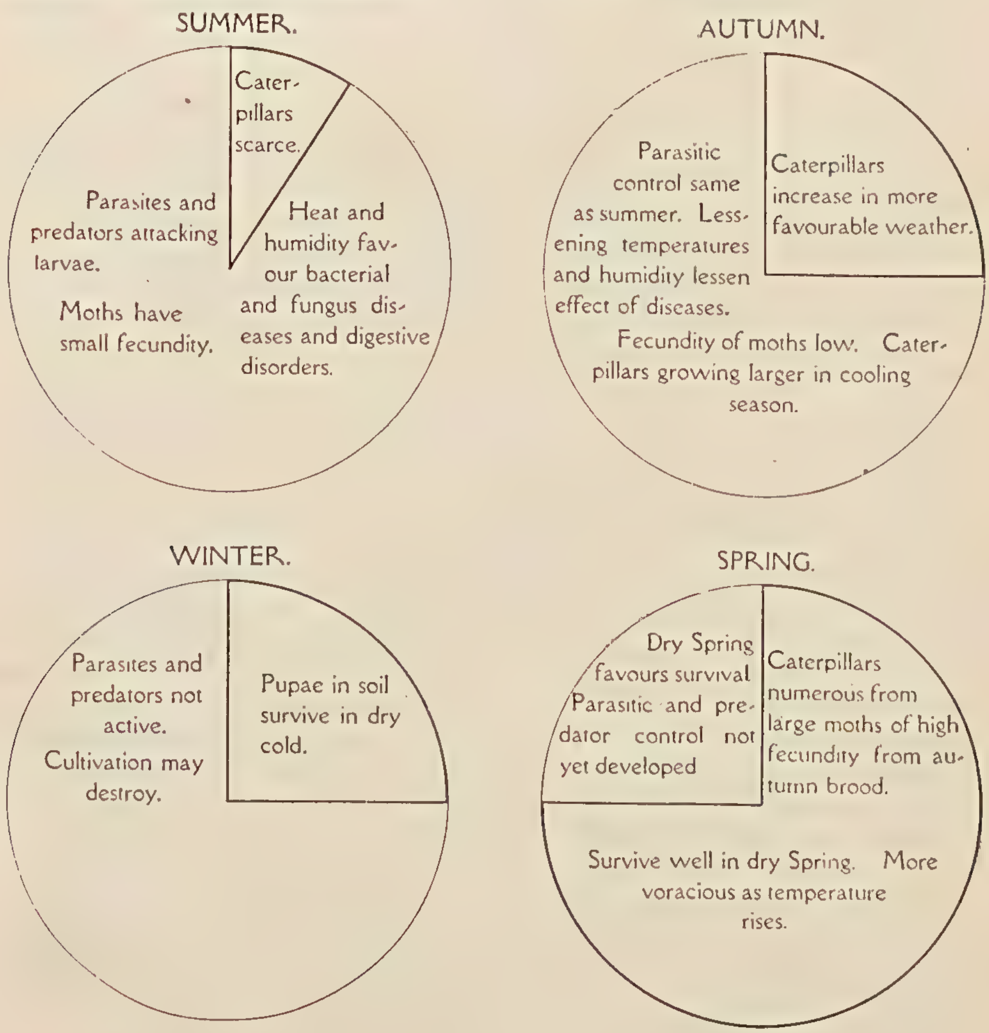
few weeks in winter may bring out the adults, prematurely, so that their offspring may succumb to early spring frosts later on.

Early spring warmth with insufficient moisture for plant growth may bring out the moths before food plants are available for their offspring, and if rains are too long delayed they may die before ovipositing.

Very high atmospheric temperature may kill all stages of the species during heat waves so that excessive heat may be a factor in the control of the species. There is too little available evidence on this point to make any definite statement at present.

Damage to crops generally is most common in spring. In the case of cotton, spring is the only season when damage is possible, as the seedling stage is the vulnerable one, but even in the case of truck crops spring is the most destructive period, with an attack of less severity in autumn. The reasons for the greater incidence of the pest in spring in a year favourable to the multiplication of cutworms are shown diagramatically below. The diagrams appear to suggest that there are only three broods in the year, but four or even five are possible.

The diagrams are applicable to areas behind the coastal ranges where most of the cotton is grown.



Natural Enemies.

These have been touched on already, but no comparative estimate of their control values given.

In the dry spring when cutworm damage is most rife, parasitism incidence seems to lag behind the incidence of the pest itself. When a heavy attack has got well started, however, and the size of each individual cutworm has increased, then parasites become more active against them. Many parasites and predators attack only the later instars (fourth, fifth, and sixth), so that the younger stages can develop free from their ravages.

A continuance of climatic conditions favourable to the development of cutworms gives the parasites and predators an opportunity to increase and effect a partial control. In this the bracons are very active, being, as far as has been observed, the most useful parasites on *Euxoa radians.* In some situations the ichneumon (?) ecto-parasites are fairly common. Egg parasites and the two species of tachinids already mentioned also exact their toll. In the main, however, it appears that when climatic conditions are favourable to the breeding up and survival of the cutworms they will increase in spite of the natural enemies, over at least a considerable period, and that the sudden and drastic cessation of attacks and reduction of numbers are due to the onset of meteorological conditions unfavourable to their survival, and favourable to the development of digestive disorders and of diseases.

It is not suggested that natural enemies could not control *Euxoa radians* if it were to increase indefinitely over a long period, but that probably because it is controlled to such a degree by climatic restraints parasites do not get sufficient momentum to control its severe outbreaks. One may adopt the point of view that the parasites and predators normally keep *Euxoa radians* in control and that it requires a particularly favourable period or set of circumstances for the insect to become highly destructive.

This way of looking at it does not, however, take away from the value of correlating meteorological conditions with cutworm activities in the attempt to predict outbreaks.

Periods which are climatically favourable to the cutworm may be unfavourable to the survival and increase of the main parasitic controls, but before this could be determined each individual parasite would have to be studied from that point of view so that the whole biological fabric could be followed, and the complex interplay of the many forces understood. This is no doubt the ultimate aim of research, but for the practical control of a species can be followed only partially.

An aspect of the case that for the moment must remain speculative is connected with those areas which normally most nearly approach ideal climatic conditions for cutworm survival. In such areas control must lie with either limited food supply and suitable soils, or with parasitic control; probably with all three.

Such areas might provide centres for breeding large numbers of cutworms which could spread into neighbouring regions as these offer favourable conditions. They also introduce the possibility of mass migrations of moths from one area to another, and so of heavy attacks in the new area irrespective of the previous season's weather.

No cases of mass invasions of new areas by cutworm moths from a great distance have been observed in Queensland although, no doubt, there is always some desultory spreading of the moths.

Within the State there are localities or "natural" regions within which spread of the moths is easy but from which spread is difficult owing to some topographical barriers such as mountain ranges and barren country; climatic barriers such as dry areas, or areas of excessive rainfall.

In all such natural regions foci exist which are favourable to the survival of cutworms even in unfavourable seasons. Such an area in the humid coastal belt might be a well-drained sandy ridge, or in the case of the more arid interior it might be an alluvial creek bank with good vegetative cover which could provide food and shelter during excessively dry periods.

During times of adversity the cutworms are killed out except in these more or less permanent haunts, and when conditions again become favourable to their increase, they quickly spread within the natural region and, with continuous favourable conditions, beyond it. The point is, that breeding up to pest status occurs within the region itself, and that invasions from other regions have not been observed in Queensland. It has to be remembered that a concentration of moths may occur within any region on suitable host plants, and on cultivated soils when food is scarce, and this is one of the reasons why drought conditions favour severe damage to economic crops.

Years of careful recording of pest abundance, parasite activity, and weather data will be required before the principles underlying cutworm outbreaks can be fully understood.

It is hoped, however, that the matter contained in this bulletin will help towards an intelligent appreciation of the cutworm problem and towards an understanding of how to combat attacks.

It may also have some value in indicating possible lines of investigation for the future.

SUMMARY.

The brown cutworm, the larval stage of the noctuid moth, *Euxoa radians* Guen. is the most destructive cutworm in Queensland.

It is distributed throughout the agricultural areas of the State and annually causes damage to vegetable and field crops. In coastal areas some damage is done all the year round to vegetable crops on light soils, but most of the damage generally occurs in spring and autumn. Once in every few years a widespread and heavy attack occurs in areas just west of the coastal range during the spring months, the crops attacked being seedling cotton, young maize, and the young growth of grape vines.

The larval body is well adapted to the subterranean habit of life, and the reduction in the length of the epicranial stem in the head capsule, causing the mouth parts to point forward, instead of downward, can be taken as a measure of such adaptation. The chætotaxy of the head capsule and body segments is substantially the same as that described by Ripley[8] for other noctuid larvæ.

In coastal areas and in frost-free areas inland with an annual rainfall of 20 inches or more, breeding is continuous throughout the year, but in areas visited by frosts, only the pupal instar survives the winter season.

Eggs are laid in batches of varying sizes (in the laboratory from seven to 569), the female moths ovipositing over a series of nights under low-growing weeds or seedling crops in loose, slightly moist soil. A female moth may contain in the ovaries up to 1,200 eggs in all, this high fecundity allowing the species to breed up rapidly to pest proportions under favourable conditions.

There are six larval instars; pupation takes place in an earthen cell in the ground.

The rate of development of all stages of *Euxoa radians* Guen. varies with temperature; the growth rate increasing proportionately with rise in temperature between 20 deg. C. and 28 deg. C. Outside this range of "medial" temperatures the relation between growth rate and temperature is not directly proportionate.

The time taken to complete a generation from egg to egg is about 106 days at an average temperature of 20 deg. C., and 52 days at an average temperature of 30 deg. C. Variable temperatures with wide fluctuations give a faster growth rate than continuous temperatures.

The larvæ show a considerable tolerance to conditions of low atmospheric humidity, but continuous high relative humidity (say 80 per cent. to 100 per cent. rel. hum.) or much wetness of the soil in which they live, particularly if combined with high temperatures, brings on digestive disorders and death.

The species is controlled to a considerable degree by its natural enemies, except when weather conditions are particularly favourable to the former, when its incidence increases rapidly. Its natural enemies include a chalcid wasp parasitic on the eggs, two tachinid flies, a braconid wasp, an ichneumon and a sphegid wasp parasitic on the larvæ, and a bombyliid parasitic on the pupæ.

The distribution of the species is bound up with that of the xerophytic plant pigweed (*Portulacca oleracea*), the plant and the cutworm being both partial to light, well-drained soils. Attacks are common during dry seasons and the effects of a series of dry seasons are cumulative.

The climatic conditions leading up to an attack during any one spring appear to be:—

(1) A preceding series of dry years.

(2) Good summer rains followed by a dry autumn, which allows a big autumn brood to develop.

(3) A cold, dry winter favourable to the successful carryover of the pupæ in the soil.

(4) Moderate early spring rains with rising temperatures bringing moths from pupation and allowing the sowing and early germination of economic crops, followed by a warm, dry middle and late spring, which favours larval development and survival.

Clean cultivation will help to control the multiplication of the species in some districts, but when an attack is in progress poison baiting the larvæ is the most useful control method.

Paris green, lead arsenate, and calcium arsenate are the poisons most easily procured, and of these the first is quicker in action and more safe in use because of its warning colour.

The following formulæ are recommended against the brown cutworm in Queensland: —

(1) Paris green, 1 lb.; wheat bran (dry), 28 lb.; molasses, 1 quart.

Mix dry, add water and molasses to form a moist, crumbly mash, and apply in the evening.

(2) Calcium or lead arsenate, 1 lb.; wheat bran (dry), 16 lb.; molasses, 1 quart.

Mix dry, add water and molasses to form a moist, crumbly mash, and apply in the evening.

ACKNOWLEDGMENTS.

Thanks are due primarily to Mr. Robert Veitch, Chief Entomologist, for granting facilities for continuous, uninterrupted work during the investigations, and for making available the services of Mr. I. W. Helmsing, the illustrator whose excellent plates in colour and black and white materially enhance the value of this publication.

Thanks are also due to Mr. W. G. Wells, Cotton Specialist, for arranging facilities for travel in the cotton areas and for field work at the Cotton Research Station, Biloela; to his field staff, and to Mr. L. M. Hodge, manager of the Cotton Research Station, for valuable field notes and useful material; and finally to all members of the Division of Entomology and Plant Pathology for information willingly given when desired.

LITERATURE CITED.

1. Ballard, ''Queensland Agricultural Journal,'' 1st September, 1927.
2. Headlee, Jl. Ec. Ent. Vol. 7, p. 416.
3. Ballard and Evans, 1928. Bull. Ent. Res. Vol. XVIII. Pt. 4.
4. W. C. Cook, Jl. Ec. Ent. Vol. 20, No. 6.
5. Shelford, Jl. Ec. Ent. Vol. 19, No 2
6. C. B. Williams, T. W. Kirkpatrick. A Multiple Temperature Incubator. Technical and Scientific Service, Bull. No. 38. Ministry of Agriculture, Egypt, 1924.
7. Hayes and Garber. Breeding Plant Crops, 1928.
8. Ripley. Noctuid Larvæ. Illinois Biological Monographs, Vol. 8.
9. Fracker. Lepidopterous Larvæ. Ill. Biol. Mon. Vol. 20.
10. C. H. Curran. Bull. Ent. Res. Vol. XVIII. Part 2, pp. 166-167.
11. L. J. Newman, F.E.S. Army Worms, Cutworms, and Webworms. Jl. of Agric. West Australia, Vol. 4, No. 2, June, 1927.
12. W. Pospelov, Septicæmia in Cutworm Larvæ. Reports of the Bureau of Entomology, Vol. III., No. 1, Leningrad, 1927.
13 Woodhouse and Dutt. The Campaign against Surface Caterpillar at Mokomah in 1913. Bihar and Orissa Agric. Jl., Patna II., 1914.
14. R. Veitch. Report of the Chief Entomologist. Annual Report, Department of Agriculture and Stock, Queensland, 1926-27.
15. L. B. Ripley. Sodium Fluoride and Cutworms. Jl. Dept. Agric. Union of Sth. Africa, IX., No. 5, Pretoria, Nov. 1924.
16. W. G. Wells. Annual Report on Experimental Work on Cotton, Callide Cotton Research Farm, Biloela, 1926-27, p. 38, Brisbane, 1928.
17. H. L. Seamens. How to Foretell Outbreaks of the Pale Western Cutworm in the Prairie Province. Ent. Circ. 12, Ottawa, 1923.
18. H. L. Seamens. Forecasting Outbreaks of the Pale Western Cutworm in Alberta. Canada Ent. Bull. No. 3, Orilla, Ontario, 1923.

19. C. H. T. Townsend. An Analysis of Insect Environment and Responses. Ecology, V., No. 1, January, 1924.

20. W. C. Cook. The Distribution of the Pale Western Cutworm. A Study in Physical Ecology. Ecology V., No. 1, 1924.

21. W. E. Hinds. Is there any Definite Basis for Forecasting Insect Outbreaks and Ascertaining if Control Measures are Practicable? Jl. Ec. Ent. Vol. 21, No. 4, August, 1928.

22. R. A. Vickery. The Striped Grass Looper (*Mocis repanda* Fab.) in Texas. Jl. Ec. Ent. Vol. 17, No. 3.

APPENDIX.

Notes on some attacks by other noctuid caterpillars in Queensland, 1927-1928 season.

During a careful study of the species *Euxoa radians* Guen. any reported severe outbreak of caterpillars was visited, whatever the species, so that general data on caterpillar attacks could be collected.

Agrotis ypsilon Rott.

This species was often found associated with *Euxoa radians*, but proved to be more tolerant of excessive soil moisture than the latter. In one case young cabbage plants were attacked in a field from which flood waters had receded only a few weeks before.

In September and October, 1927, some damage was done to cotton seedlings by this species in the Mundubbera district. Caterpillars from that area, retained in the laboratory, made earthen cocoons in October and æstivated as caterpillars until February, 1928, when they pupated. They emerged adult towards the end of March, 1928.

Agrotis ypsilon was very destructive to vegetables in suburbs of Brisbane from April to June, 1928, and did considerable damage to young lucerne near Laidley during the same period.

Caterpillars collected in June on strawberries at Capalaba, near Belmont, pupated in July and emerged adult in late August.

In autumn and spring this cutworm is usually to be found associated with *Euxoa radians*, but in semi-arid conditions the latter predominates to a marked degree, while in conditions of excessive moisture the former is much more prevalent.

In 1928, a few weeks after the floods had receded in the Dawson Valley, great numbers of caterpillars of this species were seen in the areas recently flooded. Near Goovigen, a very heavy attack was observed.

Spodoptera mauritia Boisd.

The caterpillar of this moth did considerable damage to couch grass lawns in and near Brisbane during March, April, and May, 1928.

A serious outbreak of caterpillars was reported near Pimpama Island in March and April, and investigation showed that this was the species concerned. Many acres of paspalum grass were completely razed to ground level, and all graminaceous plants such as maize, sugar-cane, &c. were attacked within the affected area. The attacks originated in waste areas of swamp couch grass and spread outwards as the caterpillars grew in size and voracity. So immense were the numbers that the ground seethed with caterpillars hurrying towards new feeding grounds. They swept over grazing fields and even crossed swamps which were covered with dense growths of swamp couch grass. The portions of the

grass above water were eaten off to water level, and the caterpillars crossed by the severed stem tops.

Birds came to the rescue, parasitism became severe, and cooling weather slowed down the reproduction rate of the pest, so that no later attacks took place that year. Parasites of the hymenopterous genus *Lissopimpla* were found to be common in the pupæ.

The district is low-lying and marshy. The excessive rainfall and flooding of the summer and early autumn of 1928 would appear to have favoured the species and suppressed the parasitic and predatory enemies. At the same time the excessive moisture in the soil made the grasses soft and succulent, and so more suitable as food for all stages of the caterpillars.

Whether both of these factors operated to cause the serious outbreak or which was the more important factor could not be determined, but what stood out clearly was the correlation between excessive wet and outbreaks of the pest.

Remigea frugalis Fabr.

In May, 1928, severe damage was done to paspalum grass in the Cooroy district. In this case the grass was not razed to the ground, but the outer leaves were left to wither, while the inner shoots were eaten off continuously as they appeared. The caterpillar mainly concerned with this damage was a long yellow-brown semi-looper of the species named.

The grazing fields attacked looked as if blasted by drought. Some farmers had run a fire over the withered leaves to kill the caterpillars and pupæ hiding there, but a general feeling existed against this practice, as paspalum recovers but slowly from the effects of fire.

When about to pupate the larvæ draw together a few withered leaves near the base of a stool and spin a loose silken cocoon in which pupation takes place. In this instance, too, there appeared to be a correlation between excessive moisture and pest outbreak.

A parallel case is reported from America.[22] In that case the insect concerned was an allied species—*Mocis* (*Remigea*) *repanda*—the damage being done to graminaceous plants. The severe outbreak came in a period of excessive rainfall which followed a very dry period.

In the case of the attack at Cooroy, in Queensland, and in the American outbreak, the army worm *Cirphis unipuncta* Haw. was present, along with the *Remigea* spp., but in much smaller numbers.

In the case of the four insects considered, it is clear that the outbreaks of *Remigea frugalis* and *Spodoptera mauritia* were positively correlated with excessive precipitation, that *Agrotis ypsilon* was an intermediate type, and that *Euxoa radians* survived best under semi-arid conditions.

A VALUABLE JOURNAL.

A Woombye Orchardist writes: "I think the Journal is honestly worth pounds to every man on the land."

STATE FARM, HOME HILL.

THIS property, aggregating 206 acres in area, the major portion of which is irrigable and suitable for cane production, is to be offered for sale, tenders being called for the purchase of same. Tenders, on forms provided for the purpose, will be received at the Department of Public Lands, George street, Brisbane, up till noon on Saturday, 17th January, 1931.

Conditions of Sale.

The Farm is to be sold as a going concern on a walk-in, walk-out basis.

Terms: One-fifth cash, balance over a period of 10 years, payable half-yearly with interest at 6 per cent. per annum.

Tenders should be accompanied by a preliminary deposit equalling 2 per cent. of the amount of the tender.

The highest or any tender will not necessarily be accepted.

PLATE 4.—CANEFIELD NO. 7. E.K. 28. 7·9 ACRES.

Description of Land.

Situated north-easterly of and within half a mile of the township of Home Hill, comprising two blocks divided by Burdekin Road, which form part of Inkerman Repurchased Estate within the Inkerman Irrigation Area.

(*a*) 106 ac. 2 rd. 19 pls., known as Lennox's Farm.

(*b*) 99 ac. 1 rd. 21 pls., known as the Town Block.

The whole described as portion 160, parish of Inkerman, county of Salisbury.

Purpose for which the Farm was Established.

The farm was established for experiment purposes at the time of the initiation of the Inkerman Irrigation Scheme, and has since been carried on as such, special attention having been given to sugar-cane experiments in the way of irrigation, fertiliser and varietal tests.

Careful records of yield and production costs have been kept, and the yields shown under the heading of "Cane Crops and the Marketing of Cane" are in accord with the office records. A variety of crops has been tested at the Farm to determine their suitability to the district and their economic possibilities under local conditions.

Improvements.

A good deal of clearing and development work has been carried out. The cultivation land on Lennox's Block, some 80 acres in extent, has been graded for irrigation purposes. On the Town Block 45 acres are cleared and fit for the plough, a portion of which—19 acres—has been graded. Substantial improvements have been erected on the latter area, comprising—

Manager's Residence—45 feet by 45 feet on 6 feet blocks, with verandahs on three sides. Four rooms in main building, with kitchen and pantry; bathroom, and small bedroom on end of verandah; also an office under the house.

Plate 5.—Manager's Residence.

Foreman's Cottage—42 feet by 10 feet; verandah back and front, with bathroom on end of verandah. Detached kitchen, 16 feet by 10 feet.

Farm Buildings—Erected in quadrangular form, comprising 16 stalls for horses 10 feet by 6 feet, loose box, chaff room, workroom, and implement shed.

Main Water Service.

Comprises two wells about 50 feet deep, lined with 6-feet diameter concrete cylinders; such being fitted with electrically-driven motors, centifugal pumps and accessories, representing the standard equipment installed by and the property of the Irrigation Commissioner.

Pumping capacity, No. 1 Well (Lennox's Block), approximately 40,000 gallons per hour.

Pumping capacity, No. 2 Well (Town Block), approximately 40,000 gallons per hour.

Existing Water Rate.

£5 per acre per annum, on a benefited area of 70 acres, payable by purchaser.

PLATE 6.—CONCRETE-LINED CHANNEL, LEADING FROM NO. 1 WELL. LENNOX'S BLOCK.

Domestic Water Service.

One 4-inch centrifugal pump is installed on one spear head and provides approximately 300 gallons per minute for supply for residences and stables, also for irrigation of garden plots. This pump is driven by one 8 h.p. "G.E." motor, which provides power for chaffcutting purposes in addition to pumping duty.

This material also is the property of the Commissioner for Irrigation and Water Supply.

Irrigation Channels, Etc.

Fifteen chains of open concrete channel and 9 chains of 18-inch Hume piping are in use at No. 1 Well, and 8 chains of 18-inch Hume piping at No. 2 Well, with an aggregate of about 50 chains of main open ditches on both blocks.

Drainage Well.

One concrete-lined well 20 feet deep, with iron grid cover, is situated on Lennox's Block.

Fencing.

3·4 miles of boundary fencing, 5 plain and 1 barb wires supporting wire netting; also 1·1 mile of 3-wire subdivision fences, with the necessary cyclone gates (4).

Implements.

These comprise:—Table-top wagon; 1 truck carrier, with key and rail points; dray; Mayne and White chaffcutter; I.H.C. grain and fertiliser drill; No. 4 McCormack mowing machine; hay rake; Dictator

cultivator; Cotton King disc cultivator; two-row scarifier; 1 new and 1 old single-horse scarifier; pony plough; 2 drill ploughs; 1 sub-soiler; 1 butterfly attachment; 1 Louvre grader; 1 Buck scraper; 1 smoother; 2 sets iron peg-tooth harrows; hand-power corn sheller; McKay maize planter and cultivator; 8-disc one-way Sunshine cultivator; wooden roller; 2 only double disc Sunshine ploughs with 4 spare discs; 1 old single-horse maize planter; 6 cwt. platform scales.

Tools and Sundries.

These comprise a wide range of miscellaneous plant and tools used in the working of the property, full lists of which are available.

Horses and Harness.

Twelve draughts (Clydesdales and Suffolk geldings and mares), and one saddle horse, together with a full equipment of harness for all farm purposes; also a saddle and bridle.

Seven of the draughts are good, useful, farm horses, in good working order; five are aged and only fit for intermittent work.

Plate 7.—Plot "A," No. 9 Field. Badila. Planted June, 1929. Irrigated; Short Row Hawaiian System.

Cane Crops and the Marketing of Cane.

The Farm is connected by tramway with the Sugar-mill at Carstairs, the tramline being laid alongside Lennox's Block, in close proximity to the cane crops.

The cane assignment is 72 *acres gross*—54 *acres net.*—34 acres are under plant cane and 5 acres first ratoons of Badila, E.K. 28, and other varieties.

This year's crop of cane amounted to over 1,439 tons.

Gross and Average Returns of Cane, 1922 *to* 1929, *inclusive.*

Year.	Tons Plant.	Tons Ratoons.	Tons Stand-Over.	Totals.	Average Yield per Acre in Tons.	C.C.S. on Milling Cane.	Wet Season Rains.	Total Rain and Irrigation during production.
						Per cent.	Inches.	Inches.
1922 ..	629	..	..	629	27·83	12·53	14·30	79·76
1923 ..	473	273	..	746	18·20	14·20	2 06	48·81
1924 ..	515	245	..	760	27·00	13·95	15·34	62·00
1925 ..	635	64	..	699	31·80	12·20	23·35	92·19
1926 ..	383	185	309	877	17·72	15·55	9·67	100·80
1927 ..	477	296	..	773	25·75	15·15	28·83	74·27
1928 ..	763	141	..	904	27·16	14·07	31·18	68·13
1929 ..	1,188	217	..	1,405	35·01	13·53	35·54	69·73
Averages	633	178	38	849	26·31	13·91	..	74·46

NOTE.—Notwithstanding irrigation the yield of cane is largely governed by the "wet season rainfall (January, February, and March).

Other Crops.

	Acres.		Acres.
Oranges	5	Pineapples	$1\frac{1}{4}$
Cavendish bananas ..	2	Lucerne	$1\frac{1}{2}$

PLATE 8.—STOOL OF CAVANDISH BANANAS.

Summary.

This property is in a good district, has an attractive cane assignment, and offers exceptional advantages and conveniences to any person who wishes to step right into a going concern.

Further particulars, together with Tender Forms and full lists of tools, sundries, &c., are obtainable on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, the Secretary, Land Administration Board, Brisbane, or at the Lands Offices situated at Townsville, Cairns, Innisfail, Bowen, Mackay, and Bundaberg.

STATE FARM, HOME HILL.

INFORMATION IN RESPECT OF CANE CROPS TO 30TH NOVEMBER, 1930.

Date Planted or Ratooned.	Field or Plot Number with Area of Plot.		Variety.	Irrigation and Rainfall (Inches). Year 1929 (8 Months to 31st Dec.). Year 1930 (to 30th Nov.).						Harvested.			Condition of Crops, etc., as at 30th Nov., 1930.
				Irrigation.	Rainfall.	Irrigation. One Month before Planting or Ratooning	Irrigation. After Planting or Ratooning	Rainfall. One month before Planting or Ratooning	Rainfall. After Planting or Ratooning	Date.	Tonnage to Mill.	For Plants.	
1929.		Acres.								1930.			
September	No. 5 Field	9·10	E.K. 28 ..	13·1	4·80	..	9·14	0·05	19·99	July ..	134·62	2·50	..
August ..	Plot E of 6	0·25	Badila ..	8·9	4·80	..	6·10	..	19·99	July ..	390·0	..	Percolation irrigation test
October ..	Plot C of 6	4·00	Badila ..	17·51	4·68	..	13·94	0·07	18·79	June ..	35·76	..	Including standover portion
May ..	No. 9 Field	5·15	Badila ..	27·34	10·38	..	33·23	6·10	20·50	August ..	98·14	23·98	Includes short row Hawaiian irrigation plot
May ..	Plot D of 6	4·30	Mixed ..	12·93	10·34	..	16·68	6·10	20·50	Sept. 23	121·14	8·87	..
October ..	No. 2 Field	3·60	Badila ..	10·88	4·75	..	16·40	0·07	20·50	Sept. 1 ..	54·96	..	Ordinary irrigation versus modified Hawaiian system
June ..	Plot B of 6	4·50	Badila ..	13·43	4·80	..	16·47	..	20·50	Oct. ..	125·49	23·80	
July ..	No. 7 ..	7·90	E.K. 28 ..	17·63	4·80	..	29·65	3·04	20·50	Nov. ..	402 00	..	Heavy crop
November	No. 1 ..	1·50	E.K. 28 ..	5·30	4·68	..	..	..	20·50	..	..	18·60	Off 1½ acres; balance used for horse-feed
		40·30									1,362·11	77·75	
1930.													
April ..	Plot F of 6	5·30	E.K. 28 ..	..	..	..	5·87	1·60	10·00	Planted for 1931 season			Full strike and stooled out well
May ..	No. 4 ..	4·60	E.K. 28 ..	..	..	..	5·62	..	10·00				Full strike and stooled out well
June ..	No. 3 ..	9·80	Badila ..	..	..	..	..	1·71	7·45				Full strike and secondaries showing up
July ..	No. 8 ..	9·50	Badila ..	..	..	..	..	0·51	5·74				Good
September	Plot E of 6	1·00	Korpi ..	..	..	2·50	..	..	5·74				Late, but promising
September	No. 1 ..	4·60	Korpi and Badila	..	..	5·90	..	..	5·74				Late, but promising
		34·80											

NOTE.—Planting in all cases 5 feet by 14 inches.

RURAL ROUTES IN QUEENSLAND.

THE WORK OF THE MAIN ROADS COMMISSION.

A web of well-constructed arterial highways is spreading gradually over Queensland. This is the result of a soundly organised programme by the Main Roads Commission in co-operation, where necessary, with Local Authorities. In the ninth Annual Report of the Commission, from which the subjoined notes are taken, a year's work is interestingly reviewed.

Through the courtesy of the Commission we are enabled to reproduce some of the excellent plates included in its report, and which illustrate the immense value of its services to the State.

SUMMARY OF OPERATIONS.

EXPENDITURE on roads during the past year, including all essential charges, was £1,232,712. as compared with £1,141,810 during the previous year.

The Commission willingly undertook its share in the road works programme decided upon by the Government, and with the approval of the Minister for Railways and Roads (Hon. Godfrey Morgan) has subsidised the Unemployment Relief Fund in the matter of relief works on main roads—such subsidy consisting of the provision of materials, floating plant, supervision, and cost of plant hire on the jobs. All labour costs are reimbursed from the Unemployment Relief Fund.

The selection of works has been confined to those which would not ordinarily have been included for some considerable period in the ordinary main roads programme. All works are subject to the approval of the Minister for Labour and Industry (the Hon. H. E. Sizer).

It is gratifying to report that the whole of the works started at short notice throughout the length and breadth of the State practically without a hitch. Complete liaison has been established with the Department of Labour and with Local Authorities who have been utilised to a very large extent as the constructing authorities, as in the case of main roads works.

Local Authority unemployment relief schemes not on main roads have been controlled and inspected by the officers of the Commission.

Labour Efficiency.

An opinion which the Commission has long held in regard to available labour in Queensland has been strikingly confirmed in connection with this scheme. It is that there exists only a very small percentage of unemployables, and our estimate of the efficiency of such casual drafted labour has been fully realised.

The resources of the Commission have been made available to the Minister for Labour in the direction of controlling works other than road works, such as land clearing and other operations.

Research.

The research work undertaken by the Commission's officers in design and construction methods, together with the experimental work, is bearing harvest, and the co-ordination of field works, laboratory work, and design is being steadily improved.

Increased mileage for a given capital expenditure has been the result, and has increased the difficulty of securing sufficient output from the drawing office and survey staff to keep pace with it.

It is becoming increasingly apparent that much of the south-western area adjacent to the railway line will in the near future become of much greater importance in dairying, agricultural, and pastoral industries than higherto owing to the eradication of prickly-pear under the direction of the Prickly-pear Land Commission.

Considerable attention to the construction of feeder roads to the railways will be given in this area, which contains millions of acres.

Graphic representations of the average annual and monthly evaporations, together with the rainfall precipitations during the growing period, in the area referred to, shown in comparison with other wheat-growing areas, are appended to the Report to illustrate the reason for this point of view.

Our rich dairying and agricultural areas are worthy of even more attention to road construction than has been given. This is well instanced by the results achieved by the Commission in Gayndah and Kingaroy Shires and along our coastal belt.

Development in the Mary Valley.

The following letter from Landsborough Shire quoted in the Report indicates the development which is likely to occur as the result of further road and bridge construction along the Mary Valley. The letter refers to the construction of the main road between Landsborough and Brooker's Corner, and improvements to Conondale road by the construction of "Grigor" and Elaman Creek bridges and to maintenance work carried out on this road:—

> "*Dairying and Pig Raising Industries.*—It is estimated that these industries have increased 100 per cent. during the last two years. Prior to the construction of the bridges, the farmers suffered a great loss owing to frequent heavy rains rendering it impossible for them to market their produce. Loss from this cause has now been eliminated. As a result of road improvements, motor transport has superseded horse transport, and as a consequence of this the cost of carting cream has been reduced from 6d. per gallon (horse transport) to 4½d. per gallon (motor transport). The cartage on pigs to Landsborough has been reduced from 7s. per head to 5s. per head.
>
> "*Timber Industry.*—The motor charge for hauling all classes of timber from Conondale to Landsborough is now 7s. per 100 superficial feet. Previously only pine, cedar, and other soft woods could be removed, as the cost of haulage namely, 15s. per 100 superficial feet—was prohibitive so far as hardwood was concerned. With reduced haulage costs, however, some 500,000 superficial feet of ironbark and other classes of hardwood have been marketed. It is estimated that over 10,000,000 superficial feet, most of which is first-class hardwood and a large quantity suitable for bridge work, are now available, all of which will be hauled over the Conondale to Landsborough Main Road.
>
> "*Banana Industry.*—Some four or five years ago a small experimental area of bananas was planted, the result being most encouraging, as it demonstrated that the land is eminently suitable for the prolific production of bananas of the highest grade and quality. This has led to the planting of some 200 acres up to the end of last year, most of which area is in bearing. A further 150 acres are being prepared for planting this season. There are several hundreds of acres of land in the district equally suitable for growing this class of fruit. Without the present main road facilities it is doubtful if the banana industry at Conondale would have been a payable proposition. Under the circumstances, the grower finds it a lucrative occupation.
>
> "*Agriculture.*—The advent of a good main road has made available a large area of rich agricultural land. In addition to maize, most of which is used locally, chiefly for pig-raising, English potatoes are being grown. It is estimated that 100 tons of this commodity are now being forwarded annually to Brisbane markets from Conondale, the reduced motor haulage costs being the sole factor."

A further instance of the benefits of main roads construction and of the general policy of the Commission is evidenced by a letter recently to hand from the Gayndah Shire, a copy of which appears hereunder.

Gayndah Shire, previous to the inauguration of Main Roads work, was a country of blacksoil roads, mostly impassable in wet weather. There have been now some 48 miles constructed by the Main Roads Commission, 27 miles of which are on through roads in dairying and agricultural areas.

Other important highways have been constructed in different parts of the State, and the Commisison is fully informed of the road needs of every rural community and is in close touch with the Local Authorities in respect of future development.

The accompanying camera record of some of the work undertaken or completed in the course of the year gives a good idea of the influence of the Main Roads Commission on country life in Queensland.

PLATE 9.
KINGAROY—BELL ROAD, WAMBO SHIRE.
A connecting link between the Darling Downs and Burnett Districts.

PLATE 10.
KOLAN RIVER BRIDGE, ON THE GIN GIN—MIRIAM VALE ROAD.
This bridge is over a river subject to frequent flooding.

PLATE 11.
TAROOM—WANDOAN ROAD, IN THE TAROOM SHIRE.
A part of the Leichhardt Highway and a valuable feeder to the railway.

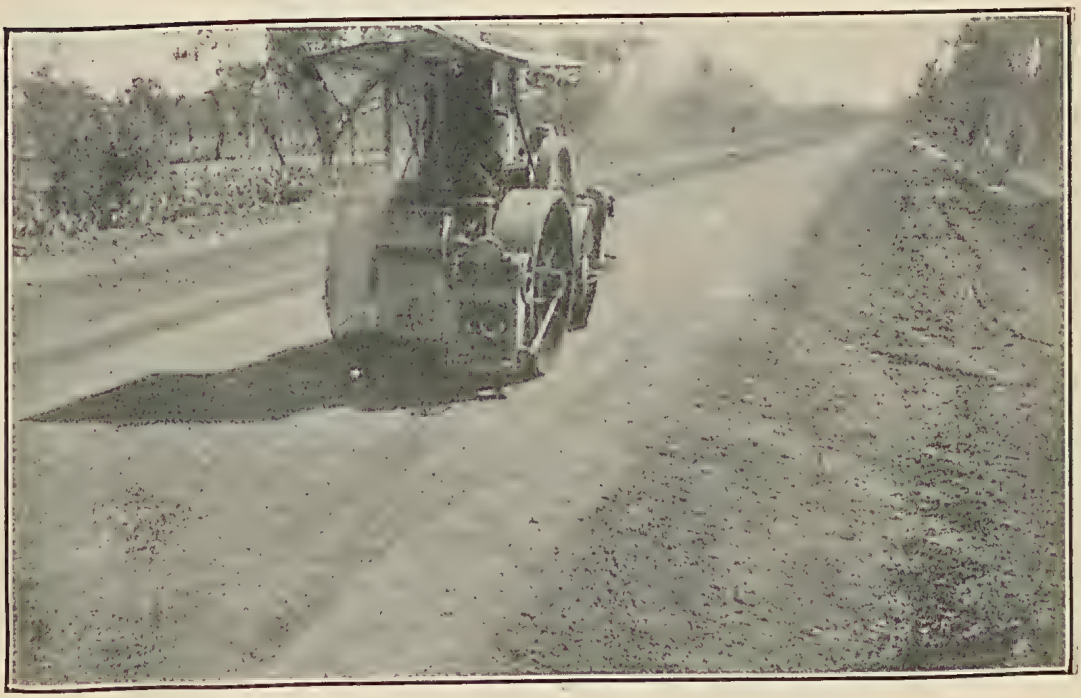


PLATE 12.
ROLLING IN SCREENINGS ON THE FIRST BITUMEN COAT ON THE THALLON—ST. GEORGE ROAD.

PLATE 13.
STANWELL—RIDGELANDS ROAD, FITZROY SHIRE. A "C" CLASS METAL ROAD SERVING DAIRYING AND AGRICULTURAL CENTRES.

PLATE 14.
A "C" CLASS METAL SECTION OVER HEAVY BLACK SOIL ON THE CLIFTON-ELLANGOWAN ROAD IN CLIFTON SHIRE.

PLATE 15.
BRIDGE OVER THE SOUTH MAROOCHY RIVER, ON THE YANDINA—MAROOCHYDORE ROAD.
Built to replace an old bridge washed away by flood.

PLATE 16.
DAYMAR—ROCKWELL'S ROAD, IN WAGGAMBA SHIRE.
A gravel road which has cost very little for maintenance.

PLATE 17.

SMITH'S CROSSING, OVER THE KOLAN RIVER, ON THE BUNDABERG—INVICTA ROAD, IN GOOBURRUM SHIRE.

This bridge gives access from large canegrowing and dairying areas to Bundaberg.

PLATE 18.

PETRIE CREEK BRIDGE, ON THE YANDINA—MAROOCHYDORE ROAD.

This bridge is a connection between two sections of Nambour township.

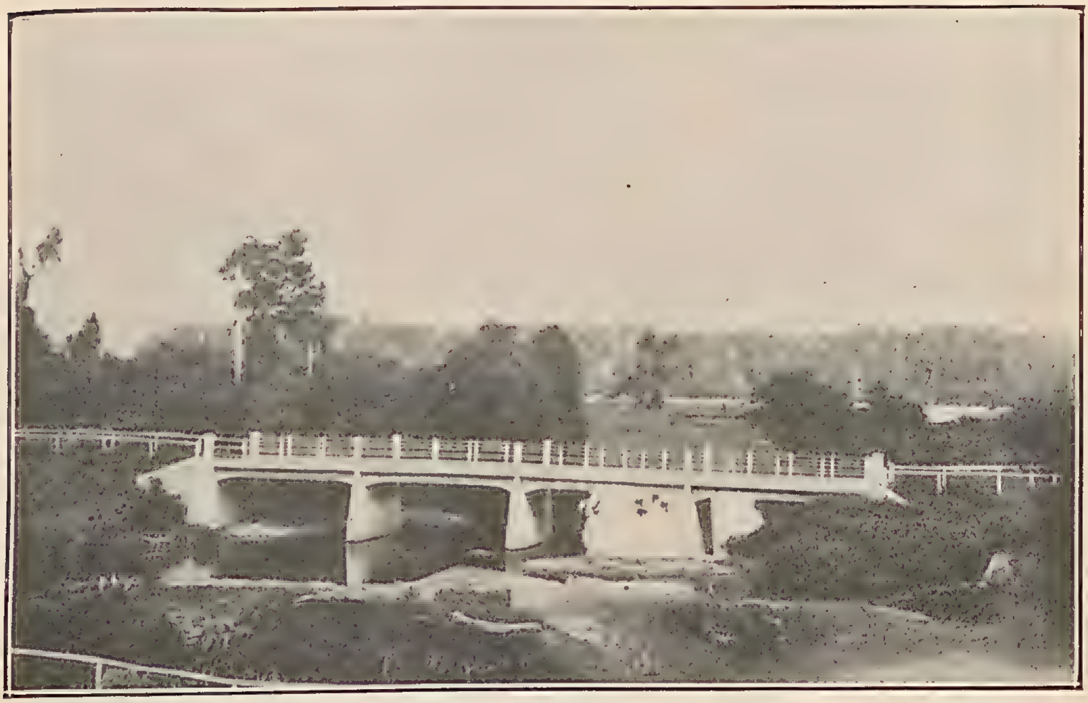


PLATE 19.
MENA (OR STEWART'S) CREEK BRIDGE, ON THE INNISFAIL—SILKWOOD ROAD.
This bridge is across a swiftly flowing stream subject to frequent flooding.

PLATE 20.
BURDEKIN RIVER BRIDGE, ON THE AYR—HOME HILL ROAD.

PLATE 21.
CEMENT PENETRATION, INGHAM—HALIFAX ROAD.
A finished job showing evenness of surface.

PLATE 22.
GOONDIWINDI—GUNDABILLA ROAD, IN GOONDIWINDI TOWN.
An example of bladed bitumen mix.

PLATE 23.

A SECTION CONSTRUCTED OF LOAM ON THE GOONDIWINDI—GUNDABILLA ROAD.

PLATE 24.

AN UNIMPROVED SECTION OF THE MOUNT LARCOM—BRACEWELL ROAD IN CALLIOPE SHIRE.

PLATE 25.
AN IMPROVED SECTION OF THE MOUNT LARCOM—BRACEWELL ROAD IN CALLIOPE SHIRE.
Constructed for the carriage to rail of the produce of an important dairying district.

PLATE 26.
CUNNINGHAM STREET, DALBY.
An example of bituminous penetration macadam work.

Plate 27.

Coomera River Bridge, on the Main South Coast Road.

This bridge takes the place of a ferry which greatly impaired the efficiency of the road.

Plate 28.

A Typical Western Flood Crossing on the Isisford—Emmett Road.

An example of the work being done in the outlying districts of the State.

DEPARTMENT OF AGRICULTURE AND STOCK.

VISIT OF PARLIAMENTARIANS.

AT the invitation of the Minister for Agriculture and Stock (Mr. H. F. Walker) a party of Members of Parliament made an informal inspection of some of the technical branches of his Department recently. The visitors included—The Speaker (Hon. C. Taylor), Mrs. Irene Longman, Dr. P. J. Kerwin, Messrs. J. D. Annand, G. P. Barnes, R. L. Boyd, F. W. Butler, W. E. Carter, E. H. C. Clayton, E. Costello, T. A. Dunlop, J. B. Edwards, E. L. Grimstone, R. Hill, T. Nimmo, T. R. Roberts, E. B. Swayne, and W. J. Wellington.

A tour was made of the Chemical, Pure Seeds, Entomological, Pathological, and Cotton Laboratories, also the Wool and Seeds Stores.

Central Meat Inspection Depot.

The visitors were given interesting demonstrations and explanations of the methods employed at the Central Inspection Depot in connection with the examination of veal and pork for metropolitan consumption.

The depot, which is situated within Departmental precincts, it was explained, is available to butchers and farmers for the examination of carcasses from Monday to Saturday in each week. Thursday and Friday are the busiest days. Inspection is most thorough, and for the year 15,533 carcasses of veal and 7,433 carcasses of pork were submitted to critical scrutiny. The visitors were much impressed with the value of this work, especially in regard to public health. Meat was condemned in their presence and the reasons were clearly demonstrated. They were also shown how easily an unscrupulous butcher might secure an advantage in respect of any lax or incompetent inspection.

Farmers' Wool Scheme.

The wool room was next visited, and the details of the wool realisation scheme instituted by the Department for the benefit of small flock owners was interestingly explained. Clips ranging in quantity from a single fleece to several bales are received for classification and sale. On delivery weights and value a 60 per cent. advance is made immediately and the balance is paid on realisation. The total cost works out at 10s. a bale, and at that figure the scheme is entirely self-supporting. The wool is handled by expert classers. Under the system the small grower receives the same consideration and advantages as the large pastoralist in marketing his product. The visitors were impressed with the value of the scheme from every aspect of the wool industry.

Wheat and Maize Breeding.

The seed room was next visited, where the results of grain breeding and cultural tests were displayed in great variety. The system of wheat and maize propagation and improvement was explained in detail, and it was shown how seed wheat bred and distributed by the Department has undoubtedly been of substantial economic value to the wheatgrowers of the State.

Chemists' Laboratory.

From there the visitors went on to the laboratory of the Agricultural Chemist where interesting analytical work was in progress. This laboratory is regarded as one of the most modern and best equipped in the Commonwealth. From a one-man show over thirty years ago it has advanced to its present high state of efficiency both in personnel and equipment. Over a long series of years this Branch has performed much valuable work for the farmer, the results of which are made readily available in the "Queensland Agricultural Journal" and other publications that have an accepted text-book value for those pursuing a study of our rural problems. That work covers stock nutrition experiments, pasture improvement, and improvements in fodders, grains, and field crops generally. Both fundamental and applied research are also undertaken in respect of fertilisers, dipping fluids, and stock foods. Added to all these avenues of investigation is the regular routine work

PLATE 29.—VISIT OF MEMBERS OF THE QUEENSLAND PARLIAMENT TO THE DEPARTMENT OF AGRICULTURE AND STOCK.

The Minister (Hon. Harry F. Walker) is third from the left. On his left are Mr. W. J. Wellington, M.L.A., Mrs. Irene Longman, M.L.A., Hon. Chas. Taylor (The Speaker), and Mr. R. L. Boyd, M.L.A. In the second row, left to right, are Mr. J. B. Edwards, M.L.A., Dr. P. J. Kerwin, M.L.A., Major E. Costello, M.L.A., Messrs. J. D. Annand, M.L.A., E. H. C. Clayton, M.L.A. (immediately behind Mr. Taylor). Back row: Messrs. E. L. Grimstone, M.L.A., F. W. Butler, M.L.A., T. R. Roberts, M.L.A., and T. A. Dunlop, M.L.A. Departmental officers in the group are Messrs. E. Graham, R. Wilson, R. P. Short, and J. F. Reid.

embracing a comprehensive series of analyses of great importance to the manufacturing as well as to the producing side of rural industry in Queensland. The chemist also collaborates with the agricultural specialists in carrying out regular series of field experiments, including pasture renovation and fodder plot trials.

The next call was made at the laboratory of the Pure Seeds Branch, where it was demonstrated how the farmer is protected from imposition in respect of the quality of seeds, stock foods, fertilisers, and pest destroyers.

So interested were the visitors in the work of the technical services already inspected, that it was impossible to carry out the full programme arranged. Another visitation, however, has been planned for the Parliamentary recess, when it is hoped that it will be possible to make a complete inspection of all the scientific and technical services available to the Queensland farmer.

Departmental Services.

Afterwards the party assembled in the Minister's room where a fine range of samples of Queensland-grown tobacco of light, medium, and dark types for pipe and cigarette use, mainly from Harvey's Range and Home Hill, were displayed for their inspection. The aroma of every sample elicited very favourable comment.

In expressing appreciation of the visit and the interest shown in the activities of his Department, Mr. Walker said that the question had sometimes arisen as to what the Department was doing, and he had accordingly invited members of the Parliament to pay an informal visit and see and estimate for themselves the work of his technical officers and its value to the community. He paid a tribute to his staff, saying that he was proud to be associated with the highly-qualified men who were performing such valuable services for the primary industries. They possessed a fine record of work well done, of sustained effort, and continued achievement, from which had come much of their wealth and progress in rural industry.

The agricultural, chemical, and associated laboratories compared favourably with those of the other States, and were regarded as among the best staffed and equipped of their kind in the Southern Hemisphere. Sir Arnold Theiler, Dr. J. B. Orr, of the Rowett Institute, Sir John Russell, of Rothamsted, and other eminent visiting scientists had all expressed themselves as impressed with the work of his Department, particularly in relation to stock nutrition and pasture improvement. Without the assistance of science, the rural industries would soon revert to a primitive state. Scientific and technical officers were performing much valuable work for the farmer, of which they had had excellent evidence that morning. (Hear, hear!) The results of that work was made readily available in the publications of the Department. He made special reference to the "Queensland Agricultural Journal," saying that it should be in the hands of every farmer. In addition, there was routine work which included a comprehensive series of analyses of great importance to the manufacturing as well as to the producing side of rural industry in Queensland.

The extent of their scientific service to agriculture was very little known generally, added the Minister, and such visits would help to widen public interest in that regard. (Applause.)

Aid to Primary Producer.

Mr. Taylor thanked Mr. Walker for the opportunity he had given the visitors of seeing something of the services rendered to the primary producer by the Department of Agriculture and Stock. He was deeply impressed with the extent and excellence of that service and the efficiency and courtesy of the officers. They all had spent a most interesting and educative hour, and he congratulated the Minister on the great progress the Department was making, particularly in its technical and scientific branches. (Applause.)

Dr. Kerwin said that he had been impressed by the modern laboratories, the scope and value of the work done, and the virility, alertness, and capability of a highly qualified staff. Scientific research had for him a special interest, and among other things he would commend further investigation of the finger cherry, a fungus of which had apparently caused sad cases of total blindness in the North. (Applause.)

PLATE 30.—THE LABORATORY OF THE AGRICULTURAL CHEMIST, DEPARTMENT OF AGRICULTURE AND STOCK.

PLATE 31.—THE WOOL ROOM, DEPARTMENT OF AGRICULTURE AND STOCK.

Small flockowners' clips are here classed and prepared for market under a system that has won the approval of both farmers and wool salesmen.

PLATE 32.—THE CENTRAL MEAT INSPECTION DEPOT, ONE OF THE ANNEXES OF THE DEPARTMENT OF AGRICULTURE AND STOCK.
Approximately 25,000 veal and pork carcasses are examined here annually on behalf of farmers and retail meat tradesmen.

NEW FRUIT TOMATO.

Mr. H. Barnes, Instructor in Fruit Culture, writes:—What is regarded as a new variety of tomato has been evolved by Mr. P. E. Donnier, of Kelvin Grove, from seed of a cross between Ponderosa and Sunrise varieties. The plants were sown late in September, and at the time of inspection, 28th November, were about 4 feet high. They were trained on a modification of the stake system. Its luxuriant foliage resembles that of the Burwood Prize variety. Its fruit is big, firm, and fleshy, and forms in large clusters (see illustration). The plants were grown on very poor, red, shaley soil, and stable manure was the only fertiliser used. Mr. Donnier has named the plant "The New Fruit Tomato."

PLATE 33.—NEW FRUIT TOMATO.

DISEASES OF THE PIG.*

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

[*Continued from the November issue.*]

PART III.

In the preparation of information dealing with Diseases of the Pig, an endeavour has been made to describe in the simplest language possible the various conditions, abnormal and otherwise, associated with the incidence or appearance of disease in swine. The suggested preventive measures and methods of treatment are such as may be successfully carried out by any careful farmer, excepting only in cases where the services of a qualified veterinarian are advised, and in these cases the best methods to follow will be suggested on the spot by the surgeon himself.

The pig is notoriously a bad patient and a difficult animal to handle when indisposed, hence great stress has been laid throughout this treatise on the necessity of preventive measures, for prevention is not only much better than cure, but is invariably less costly and a great deal more satisfactory.

In dealing with methods of treatment and the engagement of qualified aid, it has been realised there are numerous difficulties in the way, because Departmental officers or practising veterinarians are not always immediately available in town or country districts. Again, therefore, we stress that prevention is better than cure, and we might even qualify this further by adding prevention is more necessary than cure.

Mr. Shelton's bulletin, representing as it does much labour and the fruits of careful study and observation, is a welcome contribution to current pig literature.—EDITOR.

HOG LICE.

HOG Lice (*Hæmatopinus suis* Lin.) are small wingless creatures of a dull greyish brown colour that live upon the skin of the pig, feeding upon the moisture of the skin and sucking blood from the tiny blood vessels (capillaries) that abound near the surface of the body. The louse is about the size of a small nail head, its head is very long and narrow and is rounded and conical in front, with five hairs on each side, and towards the sucker three other long hairs. The abdomen is of an elongated oval shape. The feeding apparatus is like a tiny spear, and is forced into the skin in search of blood; close to its point is the mouth.

* The typescript and illustrations of the Farmers' Bulletin on Diseases of the Pig have been submitted to the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., Department of Agriculture and Stock, Brisbane, Queensland.

Copies of the Bulletin may be had gratis on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

In the compilation of this paper the writings of recognised authorities in other States and other parts of the world have been drawn on, and the assistance thus received, also that freely given by other Departmental officers, is acknowledged gratefully.

Hog lice reproduce themselves by means of eggs which the female deposits in protected spots, such as under the arms and along the back and behind the thighs. These eggs (or nits, as they are usually called) hatch out and liberate the young lice, which rapidly develop and become mature. They are very active and creep about among the bristles and shorter hairs. Their legs are provided with pincer-shaped apparatus which enables them to cling to the hair.

It cannot be said that their presence is entirely due to insanitary surroundings, as they are often found on pigs kept under the very best of conditions; still it is a business matter to keep pigs reasonably free from parasites. Strong, healthy pigs are not likely to suffer ill-effects to the extent that weak, anæmic stock are, or those that are improperly cared for and fed on an unbalanced ration.

Ordinarily these parasites are so common as to suggest that they are of very little economic importance, or that the effects of infestation are not worth considering. This is unfortunate, as the economic losses resultant upon infestation are sufficiently serious to warrant every effort being put forward to prevent or eradicate them. It should be remembered that the hog louse is a very active blood sucker and lives on pigs of any age and condition, even on sucking pigs a day or two old. The loss of blood and the irritation caused by their presence seriously interfere with the growth and development of the animals; pigs heavily infested with lice also lose their powers of resistance to other diseases.

Symptoms.

The first indication of infestation will be a severe itching of the skin; in an effort to relieve this the pig will be found rubbing vigorously against fence posts or food troughs.

Treatment.

The best form of treatment is to pen up the pigs and wash them carefully. Then make up a gallon of lice mixture as follows:—Mix together half pint of benzine, half a pint of kerosene, and seven pints of fish oil. Any other vegetable or mineral oil will suffice if fish oil is unobtainable. Best results will follow individual treatment, therefore treat each pig separately. Shake the mixture well before use (keep mixture in a clean oil-can and not in a bottle), then pour a small quantity on the animal and rub thoroughly on the places where the lice congregate, being careful to search inside the ears. If the pigs are not accustomed to being handled, and it is found inconvenient to treat them in this manner, it will be an advantage to use a soft brush or broom on a long handle. Dip this into a dish of the lice mixture and rub along the back, down the hind legs, and about the ears.

Other reliable remedies are:—Equal parts of kerosene and raw linseed oil. Sheep dip should not be used on pigs if it contains arsenic. After treatment the animals should not be exposed to the sun for an hour or two, otherwise sun scald may result. There are several commercial "pig oils" on the market well worth trial in the treatment of external parasites.

As most of the lice nits or eggs are not at once destroyed by the above mixtures, treatment should be repeated at least three times at intervals of eight or ten days. This is necessary in order to destroy the lice that hatch out of the remaining eggs. It is also necessary to

thoroughly disinfect sties and old pig crates and to clean up the yards. In order that clean pigs may be kept free from lice, care should be taken that no pigs are introduced to the piggery until they have been examined and found to be free, for these parasites spread quickly through a herd when once introduced. If, after purchase, any pigs are found to be infested, they should be treated and entirely freed from lice and nits before being allowed to come into contact with clean pigs.

Dipping pigs in a large vat similar to that used for sheep is not advised, as the pig is a difficult animal to handle at all times and strongly objects to being forced into a dip containing strong-smelling fluids. A cheap and effective way of keeping pigs free from lice is to erect half a dozen posts in the pig paddocks and yard. If corn sacks or other bagging saturated with crude, fish, or pig oil are strapped around these rubbing posts the pigs will rub against them and thus free themselves from lice. The sacks should be soaked in oil at intervals of not longer than seven days. Pieces of short-wooled sheep pelt used instead of sacking will also prove quite effective if firmly strapped to the post and kept well oiled. Wire or staple bagging to the posts, as nails alone will not prove effective where pigs are constantly rubbing.

Automatic Hog Oilers.

Though automatic hog oilers have been advertised extensively overseas and are in use abroad, they do not appear to have been a success here. They are expensive and require a good deal of attention, and, unless special care be given to them, their use is not advised. There are several types, but none are at present available in Australia at a price to make them attractive to the pig farmer.

Novel Treatment.

Discussing the matter of treating pigs for hog lice with an old-time farmer recently, the latter remarked that he had never had any trouble among his pigs, for he had made it a practice to give them a good dose of flowers of sulphur in their food every now and then, and this had never failed in keeping the pigs free from lice. This is a novel, though somewhat unreliable line of treatment with pigs, though it is said to be common practice to add sulphur to the food of dogs with a view to keeping them in good health and free from lice, ticks, &c. Another bush remedy is to keep a piece of mutton fat handy and rub the pig's back whenever opportunity offers. A corn core dipped in oil makes a good brush for use in a similar manner.

[TO BE CONTINUED.]

A USEFUL JOURNAL.

A Millmerran farmer, renewing his subscription to the Journal, writes (15th December, 1930):—". . . I am pleased to say that I have received every copy of the 'Journal' regularly, and I go through it from cover to cover and I always find something of great benefit to me. . . ."

A Thangool farmer writes (4th December, 1930):—". . . The 'Queensland Agricultural Journal' is the best farmers' journal on the market, and I would not like to miss a single copy of it. In every page there is knowledge."

VARIATIONS IN CREAM TESTS.

By CHAS. McGRATH, Supervisor of Dairying.

VARIATIONS in the percentage of fat in cream delivered from time to time by patrons of butter factories have been the cause of dissatisfaction between a number of producers and factory managements.

The Babcock method of determining the fat content of milk and cream is in general use in the dairy industry in this State, and is a reliable determination.

In the mechanism of nearly all the separators provision is made to regulate the proportion of cream by what is termed the cream screw. When the screw is turned towards the centre of the separator bowl it contracts the cream line and gives a richer or higher testing cream.

If the screw is turned outwards it widens the cream line, and by allowing a larger proportion of skim milk to pass out with the fat gives a cream with a lower fat content.

Apart from the actual mechanical standardisation there are other factors which have a material effect on the fat content of the cream delivered from the separator bowl, or which the following are the most important:—

1. Speed of Separator Bowl.

All separators are manufactured to run at a definite speed, and they will do satisfactory work at the speed specified by the manufacturer.

If the speed of the bowl is increased the centrifugal pressure is increased, which has the effect of condensing the cream, so that a lesser quantity of richer cream is delivered from the bowl.

If the speed of the separator bowl is reduced below the required number of revolutions per minute the percentage of fat content of the cream will be lowered, and will be accompanied by an excessive loss of fat in the skim milk.

A modern separator properly operated will deliver cream with a uniform fat content as determined by the setting of the cream screw, and will not leave more than 0.015 of fat in the skim milk.

2. Flow of Milk into the Separator Bowl.

The milk inlet supply to all separator bowls is regulated to feed the separator bowl to its full skimming capacity. If the flow of milk is partly shut off the cream line will be narrower, and a richer or higher testing cream will be delivered; an over supply of milk to the bowl will reduce the fat content of the cream and cause an excess of fat in the skim milk.

Regularity of feed is essential and is secured by use of a milk float.

3. The Percentage of Fat in the Milk.

Milk from an average herd will vary in fat content from day to day, and on occasions to quite an appreciable extent. This variation affects the percentage of fat content in the cream obtained by the usual method of separation by centrifugal force.

In milk testing 4 per cent. there are 4 lb. of fat in 100 lb. of milk, in milk testing 3 per cent. there are 3 lb. of fat in 100 lb. of milk.

If a representative sample of each lot of milk is passed through a separator under exactly the same conditions as to temperature of milk, rate of milk supply to the separator bowl, and speed of bowl, there will be practically the same number of pounds of cream, but the cream obtained from the 4 per cent. milk will contain practically 1 lb. of fat more than the practically equivalent amount of cream obtained from 100 lb. of 3 per cent. milk.

4. Temperature of Milk at the time of Separation.

Milk at a temperature of 70 degrees Fahr. is thicker or more viscous than the same milk would be if heated to 95 degrees. The milk at the lower temperature will not run through the separator as fast, the cream line will be narrower, and the cream will test higher than cream obtained from the same lot of milk when it is separated at a temperature of 95 degrees.

With a view of determining the extent of the influence stated conditions have on the percentage of fat in cream experiments have been carried out.

TABLE A.

Effect of variation in the speed of a hand-driven separator bowl on the fat content of the cream and skim milk:—

Per Cent. Fat in Milk.	Temperature Milk.	Turns of Handle per Minute.	Per Cent. Fat in Cream.	Per Cent. Fat in Skim Milk.
3·6	95	50	21·5	·023
3·6	95	55	24·4	·017
3·6	95	60	32·2	·016
3·6	95	65	38·5	·012

With all conditions being similar except the speed of the separator the fat in the cream delivered varied from 21.5 per cent. to 38.5 per centum. Five turns of the handle of the separator per minute below the proper speed made a difference of 6.3 per cent. in the test of the cream.

Turning the separator too slowly causes an increase in the loss of butter fat in the skim milk. Five turns per minute below the proper speed increases the loss of fat ·004 per cent.

It is most difficult to turn a separator at a uniform speed throughout the process of separation without the use of a reliable speed indicator, and the irregular speed of the separator is the chief cause of variation in the percentage of fat in cream.

TABLE B.

Showing the effect that varying temperatures of milk at the time of separation have on the fat content of the cream and skim milk:—

Per Cent. Fat in Milk.	Temperature of Milk Separated.	Per Cent. Fat in Cream.	Per Cent. Fat in Skim Milk.
	Degrees, Fahr.		
3·6	70	47·4	·046
3·6	75	43·5	·033
3·6	80	39·5	·028
3·6	85	37·0	·025
3·6	90	35·5	·014
3·6	95	33·0	·012

The effect of varying temperatures of milk at time of separation on the fat content of the cream and skim milk is very evident. It should be noted that the loss of fat in skim milk increases as the temperature of the milk is lowered from that suitable for separation.

TABLE C.

Variation in the percentage of fat in cream from milk containing different percentages of fat and separated under similar conditions:—

Percentage Fat in Milk.	Temperature of Milk.	Percentage Fat in Cream.	Percentage Fat in Skim Milk
3·3	95	28·0	0·014
4·6	95	35·5	0·013

A difference of 1.3 per cent. of fat in milk made a difference of 7.5 per cent. of fat in the cream.

The percentage of fat in the milk from a herd of cows from day to day will not vary as much as 1 per cent.; the variation does not generally exceed 0.5 per cent.

TABLE D.

Adjusting cream screw to regulate the percentage of fat in cream, all conditions pertaining to separation being similar:—

Per Cent. Fat in Milk.	Temperature Separation.	Cream—lb. oz. per 100 lb. Milk.	Per Cent. Fat in Cream.	Lb. Butter Fat in Cream.	Per Cent. Fat in Skim Milk.
		Lb. oz.			
3·5	95	8 0	43·5	3·48	·014
3·5	95	8 5	42·0	3·491	·016
3·5	95	8 8	41·0	3·485	·014
3·5	95	8 11	40·0	3·474	·017
3·5	95	9 14	35·0	3·456	·018

It is noted that when milk is separated under suitable conditions the operator can adjust the cream screw so as to deliver a cream containing the desired percentage of butter fat and maintain efficiency in skimming. As the fat content of the cream is increased the weight of the cream recovered is diminished and vice versa.

All the available butter fat is recovered from the milk if the separator is efficiently operated.

A separator in good running order, properly handled, will deliver cream testing from 20 to 40 per cent. and not leave more than 0.015 per cent. of fat in the skim milk.

The best results are obtained by delivering cream testing not less than 38 per cent. of fat during the period October to March, and not less than 34 per cent. from April to September, being the regulation under "*The Dairy Produce Act of* 1920."

The butter fat content of the cream should be regulated by adjusting the cream screw.

EDIBLE EARTHS AND SALT LICKS.

The importance of edible earths and salt licks and their use in human and animal nutrition came under consideration during the course of an investigation concerned with the nutrition of animals and the native population in Kenya Colony. In the course of this investigation fifteen samples of edible earth were analysed, and at the same time a number of samples which came to hand from Nigeria were also examined.

In view of the interest of this aspect of nutrition a survey of the literature was made by Dr. Foster. From this it will be seen that a deficiency of some mineral constituent or constituents in the foodstuffs of animals or humans is frequently indicated by pica—i.e., a depraved appetite. This may take various forms, such as earth-eating, bone-eating, or eating of fæces. The natives, apparently in an endeavour to make good deficiencies in locally grown foodstuffs and the natural fodder, themselves consume and feed to their cattle various edible earths and salt licks either occurring in or imported into their districts.

Kenya Edible Earths.—The samples examined showed considerable variation, according to the area from which they were obtained. On the whole the two elements which occur in the highest amount in these substances are sodium and iron. At the same time, they have a much higher percentage of calcium than phosphorus, the reverse of what the foodstuffs show. The majority of the edible earths are heavily loaded up with silica, this forming, on the average, about 56 per cent. of the dry matter. Two of them, however, were fairly free from silica and would make fair substitutes for Magadi soda by virtue of their sodium content.

Nigerian Edible Earths and Native Salts.—Many of the salts from this country are fairly pure salts, either chloride, carbonate, or sulphate of sodium, whilst others are heavily loaded up with silica, soil being presumably the impurity, judged by the relatively high percentage of iron and aluminium oxides. Detailed analyses of the materials from Nigeria, have been published in "The West African Medical Journal," 1929.—W. GODDEN, Rowett Research Institute, Bucksburn, Aberdeen.

CLIMATOLOGICAL TABLE—NOVEMBER, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·98	87	75	94	14	67	24	95	6
Herberton	..	81	60	92	14	50	23, 24	167	7
Rockhampton	30·03	90	68	99	14	60	4	51	7
Brisbane	30·07	84	65	97	13	59	3	95	8
Darling Downs.									
Dalby	30·06	88	60	98	22	45	15	281	5
Stanthorpe	..	79	52	89	22	38	15	149	9
Toowoomba	..	80	58	92	22	45	15	131	4
Mid-interior.									
Georgetown	29·95	97	70	103	14, 15	61	15	139	3
Longreach	29·94	98	69	105	27	59	15, 16	49	2
Mitchell	29·99	90	61	99	22	46	15	310	7
Western.									
Burketown	29·93	93	75	104	14	69	27	476	2
Boulia	29·91	100	72	109	21	64	15, 16, 17	24	3
Thargomindah	29·95	92	67	105	21	57	15	108	6

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING NOVEMBER, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov. 1930.	Nov. 1929.
North Coast.	In.		In.	In.
Atherton	2·15	29	0·74	4·22
Cairns	3·84	48	1·09	0·87
Cardwell	4·04	58	1·07	2·58
Cooktown	2·60	54	0·95	1·06
Herberton	2·56	43	1·67	5·05
Ingham	3·67	38	0·75	2·05
Innisfail	6·07	49	1·42	3·26
Mossman	4·05	17	3·43	5·04
Townsville	1·79	59	0·12	0·25
Central Coast.				
Ayr	1·66	43	0·29	0·20
Bowen	1·29	59	0·20	..
Charters Towers ..	1·48	48	0·06	0·99
Mackay	2·94	59	1·12	0·51
Proserpine	2·77	27	1·50	0·31
St. Lawrence.. ..	2·25	59	0·27	0·64
South Coast.				
Biggenden	2·74	31	1·76	5·15
Bundaberg	2·50	47	0·57	2·38
Brisbane .. .	3·68	79	0·95	1·25
Caboolture .. .	3·30	43	2·11	1·67
Childers .. .	2·68	35	2·25	3·93
Crohamhurst ..	4·25	37	2·89	3·44
Esk .. .	3·18	43	2·13	2·32
Gayndah	2·82	59	2·11	2·52
Gympie ..	3·10	60	4·49	2·49
Kilkivan	2·53	51	3·57	3·32
Maryborough ..	3·08	58	4·61	4·26

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov. 1930.	Nov. 1929.
South Coast—continued:	In.		In.	In.
Nambour	3·74	34	2·22	2·52
Nanango	2·58	48	3·48	0·92
Rockhampton ..	2·19	43	0·51	3·15
Woodford	3·15	43	2·47	2·30
Darling Downs.				
Dalby	2·65	60	2·81	2·15
Emu Vale	2·61	34	2·46	1·94
Jimbour	2·34	42	3·49	1·29
Miles	2·35	45	4·32	0·73
Stanthorpe	2·71	57	1·49	2·65
Toowoomba ..	3·22	58	1·31	1·99
Warwick	2·58	65	0·90	1·48
Maranoa.				
Roma	2·05	56	1·88	1·33
State Farms, &c.				
Bungeworgorai ..	1·95	16	1·30	1·41
Gatton College ..	2·72	31	1·43	1·70
Gindie	2·04	31	..	0·60
Hermitage	2·57	24	1·11	1·16
Kairi	2·13	16	..	2·41
Mackay Sugar Experiment Station ..	2·61	33	1·22	0,90
Warren	2·85	15	..	1·27

GEORGE. G BOND, Divisonal Meteorologist.

THE PECAN NUT.

By H. BARNES, Instructor in Fruit Culture.

THE pecan nut is closely allied to the walnut, in fact it belongs to the same natural order (Juglandacea). It is one of the hickories, and the generally accepted botanical name is *Hicoria pecan*. It grows wild in various parts of the United States and in the territories around the Gulf of Mexico. This fruit-tree is not as yet cultivated to any extent as an ordinary orchard tree in Queensland, but its possibilties as a profitable tree are well forth considering. It is one of the most important nuts grown in America, and the yield about equals that of the walnut. It is excellent in quality and delicacy.

The pecan tree can be grown in this State over a wide range of localities. It is not altogether foreign, as it is found growing in various parts. Mr. Pentecost, of Toowoomba, has a number of old trees. A few also are found in the Maryborough district. The Acclimatisation Society of Queensland some years ago introduced a number of proved and tested varieties, which have shown promising results in their gardens at Lawnton. This Department also introduced several varieties at one time, but by far the best results to date have been obtained by Mr. E. Collins under the very equitable and natural conditions of Redland Bay.

Mr. F. Petrie, of Petrie, also has a number of fine three to four-year-old worked trees, and, in addition, has upwards of 6,000 young seedlings planted out in nursery rows which will soon be ready for working over with approved varieties, and will be available for distribution.

The tree is also grown in various parts of the Union of South Africa, where it is looked upon as highly profitable.

Propagation.

The propagation of this tree from the seed is not difficult, and is similar to that of the walnut, except that as soon as the nuts are ripe those required for seed should be stratified in beds of slightly moist sand mixed with a little wood-ash; should they become very dry, it is advisable to soak them four or five days in water before placing them in beds to germinate. Dr. Morris, in his book on "Nut Growing," states that better results are obtained if the nuts are not entirely covered by soil, but are partly exposed to the influences of the weather, remembering, of course, that the soil is to be kept moist. A further method of assisting germination which recommends itself is to cover the soil in which the nuts have been planted with bags, which should be dampened occasionally. This will keep the soil moist underneath, and periodical inspection will reveal when the embryo plants are ready to shift. As soon as the nuts start to show life by splitting they are planted out in nursery rows, about 3 to 4 feet apart and a foot apart in the lines. The ground should be well worked, and must be naturally fertile or made so by the addition of manure, well rotted, and worked into the soil. The rows in which the nuts stand are usually sunk to a depth of 2 to 3 inches, and, after setting out the embryo plants, around which the soil must be well pressed, a layer of ash or weak stable manure is spread in the hollowed-out rows.

When the seedling is about a foot above the ground the tap root, which is enormous, will be found to be from 2½ to 3 feet long; during the season, when the tree is dormant, this root may be severed at about 1½ feet below the surface, and the tree allowed to remain in the ground for another year and then planted out in the orchards about 30 feet apart. Grown under favourable conditions the tree obtains enormous dimensions, and specimens in existence in America are 9 feet in diameter and 100 to 170 feet high. Although a few nuts are borne after four or five years of growth, anything like a crop is not expected till the tree reaches the age of from eight to twelve years, when the yield may reach anything from one to three bushels of fruit, increasing, as the tree gets older, up to, say, twenty bushels. The pecan, like the walnut, is very long-lived, and in deep fertile soil will grow and bear for a century or so.

Soil.

It thrives best in deep fertile sandy or clayey loams, bottom lands near river-beds and on alluvial deposits. But although it favours this type of country, it has a fairly wide range of adaptability, and many of our old worn-out banana plantations on the sides of hills and mountains could be quite profitably planted up and made to continue their sphere of usefulness instead of being allowed to remain idle. Though partial to fairly moist conditions, the soil must be well drained and the water-content always kept on the move. The tap root has the reputation of seeking water at great depths.

Planting.

In planting out, root development will be very greatly assisted by breaking up the subsoil with the aid of explosives. The use of a ¾-inch or 1-inch plug of gelignite at a depth of 2 feet 6 inches to 3 feet is recommended in the average soil. A hole is made in the ground at the site of the proposed tree with a soil auger when the soil is "dry," or if an auger is not available the hole may be jumped with a bar. The charge, with fuse and cap attached, is then lowered into the hole and the soil filled in, no tamping being required. The shattering effect of an inch plug is 7 feet laterally by 18 inches to 2 feet down. When putting in the trees the best soil should be placed in contact with the roots and well stamped throughout, except a few inches of the uppermost layer. Care must be taken that the trees are not planted too shallow. The nursery mark may even be a little below the general surface of the ground.

Grafting and Budding.

As with most other trees, the product of seedlings, however carefully selected, is variable, so that working-over of proved varieties is resorted to. Great difficulty was at first experienced in obtaining good results, but this difficulty has now been practically overcome, and with a little extra care good results are obtainable. Budwood should be taken from the previous year's growth, and H or side H method gives the best results.

Grafting.

Various kinds of grafts are used, one of the most successful and popular being the "rind or bark" graft. The "whip tongue" is also largely used in top-grafting old trees, but the "strap" graft gives better results. Mr. Allsop, of the Acclimatisation Society's gardens at Lawnton, has recently esperimented with the "slot" graft, as described by Dr. Morris in his book on "Nut Growing," and has obtained very good results. The one important point is that both buds and scions for grafting are taken from wood of the previous season. A terminal bud—that is, the fruiting bud—should not be used as a scion, as, from the habit of the tree's growth, the bud immediately before the terminal takes up and continues the main vertical growth of the tree and becomes a leader for the time being.

Stocks.

The stocks on which to work selected pecans are varieties of hickories or seedling pecans. The affinity of pecans with many of the hickories is good, and the range of adaptability to various soils may be somewhat greater than that of the pecan seedling itself, although, taking all things into consideration, pecans or pecan seedlings are probably better than those on hickories.

Up to about fifty nuts to the pound is considered a fair-sized sample of pecans, although as few as twenty-five to the pound of some varieties may be selected. The tree is monoecscious, as is the walnut, in its flowering habit—that is, the staminate and pistilate blossoms are borne separately upon the same tree. The staminate blossoms appear in clusters of catkins upon the last season's growth, somewhat in advance of the pistilate blossoms, which are found only at the terminals of the new branches.

The tree may be expected to thrive in most of the regions adapted to the culture of ordinary tree fruits of the temperate zones. As a rule, if left to grow at will, it does not stand up well against winds; no doubt pruning to give better scaffolding and greater stability to a certain extent will modify this defect.

Owing to the trees being planted at so great a distance apart, cultures of different sorts are carried on between them during the early period of the orchard's development.

SATISFIED SUBSCRIBERS.

Renewing his subscription to the Journal, a Brigalow farmer writes, 27th November, 1930: "I wish to say it is good for a farmer to get a magazine worth a hundred times the price."

A Proserpine farmer writes, 24th November, 1930: "Please find a renewal of my subscription. I get most farm papers, and of all I reckon the Journal beats the lot."

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Milk Weed.

G.A.F. (Clermont)—

Your specimen bore no flowers or seed vessels, but is evidently *Pratia erecta*, commonly known in Queensland as Milk Weed. The specific name *erecta* is rather misleading, as the plant more often than not creeps along the surface of the ground. It is a plant that has been accused on several occasions of poisoning stock, particularly sheep, though stock seem rarely to touch it. It grows in a number of situations in Queensland and develops an underground root system, particularly in cultivated ground, where it becomes a pest and difficult to eradicate.

A Vegetable Fly Killer.

INQUIRER (Brisbane).—

The flowers of *Lomatia silaifolia* have the reputation of killing flies and mosquitoes. The evidence for the destruction of the former seems quite clear, but we are not sure about the latter. Having the reputation of this plant some tests were made some years ago by us and Mr. F. Smith on the flowers of various Proteaceæ, and in Lomatia we found that the pollen, but apparently no other part of the plant, possessed a prussic-acid yielding glucoside. Whether this is responsible for the death of insects that visit the flower we will leave the entomologists to say. In spite of the fact that Lomatia flowers are poisonous, entomologists have assurred us that this plant when in flower is one of their best hosts for a multitude of insects.

Chicory.

C.J.W. (Toowoomba).—

The specimen is chicory (*Cichorium Intybus*), which has become quite naturalised and somewhat of a pest on the Darling Downs, particularly about Allora. The plant, as soon as it runs wild, seems to lose its large, carrot-like tap root, for which it is cultivated as an adulterant of coffee. It is a native of Southern Europe.

Carpet Grass.

A.B. (Pomona).—

The specimen is *Paspalum platycaule*, the Broad-leaved Carpet Grass, a tropical American grass naturalised in most warm countries, including Queensland. It is of only secondary value as a fodder, but grows on country where better classes of grass, such as Paspalum and Rhodes, will not thrive. The Narrow-leaved Carpet Grass, *Axonopus compressus* is, on the whole, a better species. A farmer in your locality who has had great experience with these two grasses is Mr. Walter Tronson, of Ringtail Creek.

Mount Isa Plants Identified.

I. J. MACC. (Mount Isa)—Your specimens have been determined as follows:—

Gossypium Sturtii. This plant is like a Hibiscus, but botanically belongs to the same genus as the Cotton. Unlike the Cotton, however, it has no fibre on the seeds.

Nicotiana suaveolens var. *longiflora.* This plant is usually called Wild Tobacco. It has been accused of poisoning stock in Queensland, and chemical tests have shown it to contain nicotine like the ordinary tobacco of commerce. In parts of Australia the natives have adopted this plant for smoking.

Acacia holosericea. We were very interested to have your remarks about the effect of this plant on children's eyes. The use of the green pods for making a soapy lather for washing hands and removing inkstains, &c., is very common in North Queensland, but we had not before heard of its affecting the eyes. This note is interesting, as the poisonous principle of the Finger Cherry which causes blindness is supposed to be a saponin, a principle similar to that in the green pods of this wattle.

Polycarpaea synandra. This plant is somewhat similar to Vanilla Tops (Sowerbaea), but belongs to a very different family.

Plumbago zeylanica, which you call Bride's White, is a different plant from the one in gardens, which is an allied species, *P. capensis.* *Plumbago zeylanica* is a native plant common in Central and North-western Queensland.

Cassia desolata. Yellow flower and crinkled pods.

Tephrosia purpurea. Not *Swainsona galegifolia.*

Erythrina vespertilio. Bat's wing Coral Tree or Cork Tree.

Eryngium rostratum. Native Cryngo.

Heliotropium ovalifolium. White weed on river banks and dry bed.

Ptilotus specatus. Not a Trichinium, but the difference is purely botanical.

Ptilotus conicus. Not a Trichinium, but the difference is purely botanical.

Evolvulus alsinoides. A densely hairy little plant with small blue convolvulus-like flowers.

Cyperus sp. A sedge with grass-like leaves and greenish-yellow heads.

Heliotropium fasciculatum. Blue flowers and small greyish leaves.

Stemodia viscosa. Your "Violet."

Acacia sp. A wattle with long narrow leaves.

Ocimum sanctum, what you called Aniseed Weed. This plant is fairly common in parts of North Queensland and is sometimes known to bushmen as Wild Marjoram. It is used by them as tea, and is said to be a good tonic with medicinal virtues.

Polycarpaea spirostylis. Smaller than *P. synandra.*

Solanum sp. Prickly plant; purple flowers.

Grevillea striata. Beefwood; long, narrow leaves; no flowers.

Acacia humifusa. Thick, round leaves; woolly stems.

Canthium oleifolium. Long leaves; many small yellow flowers.

Cassia venusta. Large leaflets; yellow flowers.

Cassia australis. Small leaflets; yellow flowers.

Capparis sp. With pulpy berries. A species of Bumble Tree or Native Pomegranate.

Goodenia hederacea. Long bell-shaped yellow flower.

Pterocaulon sphacelatum. Small woolly plant with globular flower heads.

Grevillea sp. Large leaves with spines.

Dodonaea viscosa. Hop Bush.

Mr. Hubbard has looked at the few grasses you forwarded and has determined them as follows:—

Red grass (dried up). *Iseilema membranacea.* Flinders Grass.

Kerosene Grass. *Sporobolus australasicus.*

Blue grass without flowers. *Sehima nervosum.*

Grass with dense flowers in short cylindrical head. *Pappophorum Lindleyanum.* White Heads.

Like last, but heads looser. *Pappophorum nigricans.* Also called White Heads.

Blue grass with pitted "flowers." *Andropogon pertusus.* The Bitter or Pitted Blue Grass.

Grass with plump "flowers" loosely scattered and about 4 mm. long. *Eriachne obtusa.*

Spinifex. *Triodia sp.*

The Young Farmer.

HOME PROJECT WORK.

A prize-winning essay written by Verner Kleinschmidt, Woongoolba State School, Queensland.

School club work has several objects. The main one is to introduce a better breed of cattle, pigs, and poultry. Although Australia holds the world's record for the highest production of butter by Melba (Melba XV. of Darbalara) for one year, the yield per year per cow is not as high as it should be. To bring up the average yield per cow higher, calf clubs have been organised all over Queensland and other States. This low yield per cow per year is due to the immense number of ''scrubbers'' in different dairymen's herds. Thanks to club work, these abominable ''scrubbers'' are gradually being thinned year by year. The way in which this is accomplished is a very good one.

Pure-bred bulls are presented by leading cattle breeders (if they so desire—on Club Day. They are in the district and thus the few good cattle in the neighbourhood are increased by about 10 per cent. each year. Club days help club work considerably. When a boy's parents see what has been done in connection with club work, they want him to join a club also. When pig clubs are concerned, the main thing is to procure an unsurpassable bacon pig.

In poultry clubs, a superior egg-producer should be aimed at. The extermination of the ''barndoor'' fowls is a splendid thing and should be continued. ''Barndoor'' fowls are more or less descendants of mixed breeds of fowls. Club work teaches members not to permit the mixture of their varieties of fowls, but to separate them.

The second object is that of education. It teaches members to be clean where sties, poultry houses, and calf pens are concerned. When the club organiser visits the homes of the club members, they lose points if their fowlhouses and runs are in a state of neglect. A person is filled with chagrin when he knows that he has lost a much-desired prize just through carelessness. When they find this out they clean their houses and runs thoroughly and prepare for the next club day. It is commonly said by ignorant people that pigs love dirt. This is not true. A pig only lies in dirty water on a hot day when it has no cool spot in which to rest. Pig club members learn this.

When application has been made for literature about club work it is sent, and the head teacher distributes it among the members. In these little booklets is valuable information concerning the feeding, rearing, and prevention and cures of diseases of pullets, calves, and pigs. In this way the club member is fitted for his future occupation if it is to be a farmer. Not only does the club member benefit, but his parents benefit also. They, too, learn how to treat diseases in their stock, and how to feed and rear them.

Clubs are educational in other ways. When Club Day has passed and the winner is enabled to attend the Farm Boy's Camp he meets and mixes with other boys from Queensland and New South Wales. He learns all about the industries that are carried on in other parts of Queensland and neighbouring States.

After the boy has returned he lectures to his school mates and they in turn learn what he has learnt. This new information is of considerable value to them in their ordinary school work, as well as on the farm.

Clubs help Australia to produce more, and more production means more wealth.

In the years to come Australia will appreciate fully the splendid work that school clubs have performed.

BERAT STATE SCHOOL CLUB DAY.

Jack Powell gives the following account of Club Day at his school:—

Budding farmers, all scholars of the Berat State School, exhibited the stock reared by them on Thursday, 20th November, which had been set aside as Club Day, when officials of the Departments of Public Instruction and Agriculture and Stock judged the pigs and calves; on the previous day the sties and pens in which their stock were housed were inspected. The judges had a busy time inspecting and lecturing, but the enthusiasm of club members and the interest displayed by many grown-up farmers and parents more than repaid their efforts.

Mr. Aitchison (Organiser of Home Projects) and Mr. Shelton (Senior Instructor in Pig Raising to the Department of Agriculture and Stock) had previously visited the homes of club members where inspections were made of pens and sties.

The visitors were favourably impressed with the work done by members of the club and the quality and number of the exhibits. Twelve pigs and twelve calves were exhibited. Mr. Moriarity, a dairy inspector, judged the calves for type and quality, and had much difficulty in making the awards, owing to the evenness of some of the exhibits. Both the judge and Mr. Shelton stated that many of the exhibits would do credit to a country show, and congratulated the members on their work.

A young judges' competition was also decided. The youthful adjudicators were very keen on all points, one giving the same valuation of an animal as the official judge. Mr. P. H. Imhoff, at the request of the chairman (Mr. J. J. Willett), addressed the gathering, which numbered eighty, and stressed the necessity for clubs and the lessons received as a result of project work. Mr. Aitchison gave a résumé of the work throughout Queensland, and stated that the Berat Club compared more than favourably with other clubs visited in the course of the year. Mr. Moriarity and Mr. Shelton also addressed the gathering on various phases of dairying and pig raising. Other speakers congratulated the teacher (Mr. A. W. Mackenzie) and club members upon the success of Club Day. Mr. Mackenzie briefly responded, and thanked those who had assisted. Mr. Houston conveyed the officials from Allora on their tour of inspection. Tea was provided by a committee of ladies.

Awards.

The results of the competition were:—

Senior Pig Club.—L. Hoey, 1; T. Hoey, 2; J. Powell, 3.

Junior Pig Club.—C. Houston, 1; R. Hoey, 2; D. Mackenzie, 3.

Senior Calf Club.—H. Gwynne, 1; L. Hoey, 2; T. Hoey, 3.

Junior Calf Club.—D. Mackenzie, 1; R. Hoey, 2; R. Gwynne, 3.

Junior Judging.—N. Hoey, 1; L. Hoey, 2; H. Gwynne, 3.

The first prize for the senior pig club was a stud berkshire boar donated by the Department of Public Instruction, and that of senior calf club a gold medal presented by Mr. F. W. Kajewskie (Glencoe). D. Gwynne secured the Ham and Bacon Curers' Association's medal presented for the best type of bacon pig. The judge remarked that the animal would be difficult to beat. The blue ribbon for the best type of dairy animal was secured by H. Gwynne with a fine A.M.S. heifer. Second and third places were secured by Mr. Rickert and L. Hoey respectively with jersey heifers.

An interesting exhibit was a stud berkshire board, the property of Mr. Joseph Byrne. This attracted general attention, and won much admiration.

POINTS IN PIGGERY MANAGEMENT.

Exercise is important to all young animals, but to none more than young pigs, which are naturally the most active of all the young animals on the farm. When little pigs are turned out with their dam in a meadow they will be racing round half their time, and in the course of a day must cover a distance of several miles. Deprived of this opportunity of healthy exercise, small pigs can never thrive as they should. Pigs which are confined to a small and probably dirty sty will not only grow more slowly, though eating just as much food, but will be liable to cramp and many other ailments which, under better conditions, would never have come their way. It is not only the value of the exercise itself that counts, but the fact that, being in the open and finding plenty of amusement, the pigs are prevented from getting into mischief of a kind that will do them harm. Pigs shut up in a sty with nothing to do will spend their time nosing about in filth and licking dirty troughs and palings, attached to which are the embryos of worms and other parasites. Half the troubles of pigs are to be traced to the presence of worms, and it is in the small and dirty sty that these troubles begin. Little pigs, of course, should never be confined in small and dirty sties, and from the time when they first begin to get steady on their legs—say, at about three weeks old—they are all the better for being given their liberty. That is not to say that whatever the weather they should be turned outside, or that they should be permitted to run about in a dirty yard. Some discretion must be used in these matters, but when no dry meadow is available, or the weather is bad, the opportunity for exercise in a well-sheltered and clean yard should be provided.

General Notes.

Trans-Border Stock Passings.

As the cattle tick is existent in New South Wales, it is necessary to take every precaution with regard to the admission of stock into this State at the Killarney crossing. It was thought that a more efficient inspection, involving less expense, could be effected by stock inspectors if certain days were set aside for this purpose. Consequently an Order in Council, permitting the introduction of stock at the Killarney gate on each alternate Tuesday—that is, the first and third Tuesday in every month—has been made, which will make better provision for the inspections.

The Dairy Produce Act—Recission of Regulations.

Regulations Nos. 142, 143, 146, and 149 made under "*The Dairy Produce Act of 1920*" have been rescinded and new regulations substituted therefor. These deal with the method of payment for milk and cream received at factories, and prescribe the form in which records shall be kept.

The object of these regulations is to ensure that all butter factories will keep proper books and accounts, and that all such books will be kept in a uniform manner throughout the State.

Staff Changes and Appointments.

Constable W. J. Daybell has been appointed also an Honorary Slaughtering Inspector at Rolleston as from the 29th November, 1930.

The appointment of H. A. McDonald, Inspector of Stock, Department of Agriculture and Stock, has been confirmed as from the 13th May, 1930.

The Officer in Charge of Police, Boonah, has been appointed also an Acting Inspector of Stock as from the 29th November, 1930.

Mr. R. J. T. Kidd, Inspector of Stock, has been transferred from Normanton to Burketown as from the 11th November, 1930.

Messrs. W. Dixon, J. T. Smallhorn, G. R. I. Anderson, A. Dick, and B. Dunbevand, Inspectors of Stock and Slaughter-houses, Department of Agriculture and Stock, have been appointed also Inspectors of Dairies as from the 11th December, 1930.

Solving the New Year Gift Problem.

Each year Pike Brothers go to no end of trouble to secure a range of novel and exclusive articles that will be suitable for New Year gifts. In fact, this firm, which has justly earned the reputation of being the largest house in the Commonwealth devoted to man and his needs, is also widely known for the excellent variety of useful presents that it specially stocks each year. A feature that appeals is the numerous articles that men may give to ladies. In this connection, a lady is employed on the staff, because of her special knowledge, and she interprets the orders of mere man in a manner that invariably pleases the womenfolk. This section includes items such as dainty boxes of handkerchiefs, charming sets of lingerie, hose, handbags, watches, cut glass, &c. One happy idea, originated by the firm several seasons ago and now exceedingly popular, is the New Year cheque. This idea is really a merchandise order, which is a novel way of solving the gift problem. You simply fill in the cheque with the amount you desire to give, and, of course, the name of the recipient. They then choose their own presents. Write to Pike Brothers in Queen street, Brisbane, and they will be pleased to forward you full particulars. This idea avoids any possible duplication of presents, and gives added pleasure.

Cotton Board.

An Order in Council has been approved giving notice of the intention of the Governor in Council to extend the operations of the Cotton Board for a further period of five years, that is, until the 31st December, 1936. It is also declared that the Governor in Council will receive, on or before the 5th January, 1931, a petition signed by not less than 10 per cent. of the growers of cotton requesting that a vote of such growers be taken on the question as to whether the functions of the Cotton Board shall cease on the 31st December, 1931, or continue until the 31st December, 1936.

Seasonal Greetings.

A.C.F. and Shirley's Fertilizers, Limited, Brisbane, convey kind thoughts and good wishes for a prosperous New Year to our readers.

From Pastoral Supplies Limited we have received a very fine calendar for 1931, the product of the Country Press Printery, embellished with another series of the dog pictures which this Firm brings out every year.

Grass Seeds in Fat Lambs.

Grass seed is causing a good deal of trouble this season (writes the Sheep and Wool Expert of the Department of Agriculture), and if fat lambs cannot be kept out of the grass seed areas they will stop growing and very quickly fall away. When lambs become affected with seed and their bloom is lost the best plan is to shear them immediately. The seed will not have such a damaging effect on shorn lambs, and they will be marketable again in between one and two months' time if feed is available.

After shearing, if the seed is still annoying them, a dipping in clean water will help to remove the seed which is penetrating the skin.

Wool and Skin Values.

The Queensland Pastoral Supplies, Limited, as most of our readers are aware, is a well-established and soundly financial institution trading exclusively and directly with the man on the land. The progressiveness of this company is already widely known throughout Queensland, and with its customary enterprising spirit it has recently established a new department for the handling of wool, sheep skins, hides, calfskins, marsupial skins, &c., either by directly purchasing these commodities or by the expert preparation of them for market on growers' behalf. Although the purchasing of wool, sheepskins, and hides is a new venture for the firm, this additional department is controlled and staffed by experts with lifelong experience in this trade.

Back to the Land.

Some time ago the Director of the Queensland Bureau of Economics (Mr. J. B. Brigden) threw out a suggestion by asking the question, "Could we not put our unemployed on some land and let them earn their own living until they get their jobs back again?" Subsequently to that deliverance of Mr. Brigden's the Premier of Victoria (Mr. Hogan) announced that his Government was considering a proposal to settle large numbers of unemployed on small farms, upon which they can at least grow sufficient food for their own requirements.

In a sub-leader of the "Courier," in which the foregoing facts are adverted to, the writer affirms that within a radius of 12 miles from the Brisbane General Post Office there are fully 100 allotments on which is being put into practice the principles of intensive cultivation on small holdings. Now, it is evident that if the unemployed can be helped to get a livelihood in this way several very desirable objects will be attained.

Inspired by the above mentioned considerations, another writer emphasises the fact that in this State of Queensland there is land enough and lying idle that could produce more than enough fruit, vegetables, milk, cream, butter, bacon, and eggs than would generously feed all unemployed in Australia. With this capacity in a country whose debts to assets, we are told, are as millions to billions, there should be no such thing as people in want. But, of course, transplanting penniless numbers from cities in the South to farms in the North would require considerable capital and organising ability. Still, with such undoubted potentialities, to make no effort at such a time to put some of the idle men on the idle land would be unpardonable. If people with practical knowledge of land settlement gave the subject their attention, no doubt many small schemes would be conceived, some of which would be capable of successful application.

Here is one for consideration. Many who are now being thrown out of work will have some savings, or negotiable assets. If no new outlet offers, these will soon be dissipated. This class, with its evidence of capacity and thrift, would be able to appreciate a business proposition. The cities have been pushed ahead so extravagantly the last few years that they are now overgrown, and must await the further development of the country to bring this surplus growth into profitable use.

Here, then, is a possible remedy. The fertile lands of the country contiguous to the cities and larger centres of population might be made available to all willing to cultivate a small area, if only to provide temporarily for their individual wants and the wants of those dependent upon them.

Animals and Birds Sanctuary.

Lady Musgrave Island, which is situated in the Bunker Group, about 30 miles easterly from Bustard Head, via Gladstone, has been proclaimed a sanctuary under the Animals and Birds Acts, in which it shall be unlawful for any person to take or kill any animal or bird.

The Bot Fly.

Mr. E. H. C. Clayton, M.L.A., writes as follows:—

"It has come to my knowledge that the bot fly has made its appearance in our district. I have taken the opportunity of discussing the matter with Major A. H. Cory, M.R.C.V.S., Chief Inspector of Stock, and I now enclose statement that I have received from him regarding the preventment of the spread of these flies, also the treatment recommended in exterminating them."

COMBATING THE PEST.

Mr. Cory advises:—

"To prevent the flies from finding a suitable lodgment for their eggs, the long hairs should be clipped off or singed from the nose, lips, jaws, shoulders, and legs of all horses. Regular daily grooming should be carried out to detach any fly eggs before they have time to hatch, and the parts from which the long hairs have been removed should be smeared daily with a mixture of linseed oil 20 parts, turpentine or kerosene 1 part. All manure containing bots or grubs should be destroyed by burning. After a horse is affected—viz., when the bot fly grubs are in the stomach—medicines are of little service in removing them until the summer months, when they are being naturally expelled. It is then advisable to drench with one of the following drenches:—

(1) Turpine 2 oz., mixed in 1 pint of milk; or,

(2) Carbolic acid 2 drachms, glycerine 2 oz., water 4 oz., milk 1 pint.

"Either of these drenches should be followed in a few hours by giving 5 drachms of aloes as a ball, or 1 pint of raw linseed oil."—"South Burnett Times."

NOTICE TO STOCKOWNERS.

AMENDED RATES OF STOCK ASSESSMENT FOR 1931.

Attention is hereby directed to owners of stock when lodging stock returns for 1931, that "The Diseases in Stock Acts of 1915," has been amended to provide for an increased rate of assessment in accordance with the Schedule as shown below.

NEW SCHEDULE RATES OF ASSESSMENT:—

"Diseases in Stock Acts of 1915 to 1930."

3s. for any number from 25 to 99, Horses and Cattle together, 4s. per 100 on actual number of Horses and Cattle together, and 9d. per 100 or part of 100 sheep.

"The Brands Act of 1915."

1s. 6d. per 100 on actual number of Horses and Cattle together.

EXEMPTIONS.

Note.—Under "The Diseases in Stock Acts, 1915 to 1930," owners of less than 25 Horses and Cattle combined are exempt, and owners of less than 100 sheep are exempt. Under "The Brands Act of 1915" owners of less than 50 Horses and Cattle combined are exempt.

IMPORTANT NOTE.

Every stockowner must pay assessment for 1931 at the amended rates and not the rates shown on the back of the Stock Return Forms already distributed.

Appreciation.

The technical branches of the Department of Agriculture and Stock are always eager to place their resources at the disposal of the producer, and appreciation of this practical service is manifested in many ways, of which the following extract from correspondence is typical:—"We thank you whole-heartedly for the prompt and valuable assistance which you gave us. . . . and assure you that your assistance was appreciated to the utmost."

BUYERS OF FERTILISERS.

Farmers and other buyers would be well advised never to accept delivery of any material unless it has affixed to every package a plainly printed label setting out the percentages of Nitrogen, Phosphoric Acid, and Potash, and the forms in which they respectively occur.

The buyer should also receive an invoice certificate setting out the particulars that should appear on the labels. Such certificate is the seller's guarantee as to the quality of the material.

In the absence of such label and invoice certificate, it is obvious that the buyer should at once communicate with the Department of Agriculture, William Street, Brisbane.

Buyers are urged to examine all goods on the day of delivery, and when in doubt regarding any fertilisers, seeds, stock foods, or pest destroyers, to write at once to the Department of Agriculture, Brisbane, in order that the matter may be at once investigated.

Australian Instruments Increasingly Popular.

To-day, when the problem of coping with unemployment is receiving such serious consideration from all sections of the community, when everyone is unanimous in their appreciation of the necessity to support Australian industry, it is interesting to note that pianos and player pianos that compare more than favourably with imported instruments in quality of tone and in general excellence, are now being produced within the Commonwealth. These instruments already enjoy well merited popularity. Victor pianos have proved their reliability and remarkable lasting qualities. They have shown themselves to be unaffected by changes of climate, giving equally satisfactory service to owners in all parts of Australia. It is also worthy of mention that the most recent purchase by the New South Wales Conservatorium, probably the most critical musical institution in Australia, was four Victor pianos. Many leading pianists have used Victor pianos for concert work, and speak in glowing terms of their beautiful tonal qualities. These instruments, it may be mentioned, are similar to those offered by Palings on very easy terms. The Brisbane price is £138. Another piano now being manufactured in Palings' Australian factory is the Belling. This, Palings state, is an instrument of exceptionally sweet tone, being particularly suited for the student. It is very solidly constructed, and with ordinary care will give a lifetime of service. This instrument sells at £110 f.o.b. Brisbane. In the player piano field Australia is worthily represented by the Victor "Expression" player piano and the Maxim player piano. Both these instruments are noted for the unusual strength of their construction and their reliability under Australian climatic conditions. Worthy of special note also is the fact that Victor player pianos are "Natural Expression" player pianos—the only instruments of this description in the low-price field. This means that, when used in conjunction with Palings' "Expression" player rolls, the most difficult pieces may be played with perfect expression, tempo, and modulation. The Victor player piano will also play ordinary player rolls. The Victor "Expression" player piano sells at £212 f.o.b. Brisbane. The Maxim player piano, of which the price (f.o.b. Brisbane) is £177, is considered by many competent judges to be quite equal in every respect to many imported instruments selling at much higher prices. It is equipped with a high-grade player action as well as the latest positive style transposer. It is well to remember that Palings arrange very easy terms on all instruments, and every instrument they sell is completely covered by their well-known guarantee. Messrs. W. H. Paling and Co., Ltd., will be pleased to forward free illustrated catalogues to all who are interested in these fine Australian pianos and player pianos.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE HOT WEATHER BOGEY.

Baby enjoys the hot weather. There is nothing that pleases him better than to exercise his limbs freely in the most scanty attire, or in nothing at all, unless it is to splash about in a tub of tepid water. He is released from the burden of clothing, which oppressed him in the cold season, and cramped his movements.

Hot weather is healthy. The three coolest States of Australia have the highest infantile mortality. Last year Queensland had the lowest. That hot weather is dangerous to infant life is just a silly bogey.

Of course, special care is needed during the hot season in some respects. If you overclothe baby he will suffer from prickly heat. This is caused by excessive sweating when the sweat is not allowed to evaporate freely. Dress him in cool singlets—not in heavy woollens. Outside the singlet he should wear only the coolest of airy garments, and these should be taken off when he is indoors. Do not torment him with flannel binders. Prickly heat is worst on his back, because he lies on that, and the perspiration cannot dry off quickly. Let him lie on cool sheets, or, better still, on cool vegetable mats. Turn him over sometimes, when he is asleep, and train him to lie on his side.

He does not now need so much heat-forming food. Give him rather less solid food, rather less sugar and fat (clinic emulsion for instance). But he needs more fluid, so let him drink as much boiled water as he likes between his meals. Do not forget that this is necessary for babies who are on the breast.

Boil Baby's Milk.

During warm weather all kinds of bacteria grow very rapidly, and so food does not keep, but undergoes changes, which make it unwholesome, and sometimes even dangerous. Especially is this true of milk. You know how quickly it goes sour. Unfortunately, it changes in other ways which are more harmful than sourness. Therefore, be careful to boil your milk as soon as you get it; then keep it in a cool place carefully protected from flies. Pasteurised milk delivered in bottles does not need to be boiled. It will keep good for twenty-four hours on ice; but otherwise, if you have only one delivery, you will need to boil it within twelve hours if it is to be kept till next morning. Should your milk be stale or dirty before it is boiled, it will cause loose motions. When good, fresh milk cannot be had, you may use dried milk (Glaxo or Lactogen).

Diarrhoea.

Loose motions or diarrhœa is common in warm weather, and needs careful watchfulness. Should your baby suffer from this, you must at once stop giving him milk or any kind of food except very thin barley-water slightly sweetened. Let him drink as much as he wants; he will be thirsty, but not hungry. It may be even necessary to take him off the breast for one or two days. You may also give him one teaspoonful of castor oil to clear out any undigested food. Within twenty-four or forty-eight hours he should be much better, and probably a little hungry. A little breast milk may then be given, or you may then give him whey made with junket tablets, but the whey must first be brought to the boil. If he is over nine months, you may also give him some arrowroot, cornflour, or sago boiled with water without milk, or a finger of bread baked hard and crisp. Do not give him milk foods until his motions become natural, and give the milk at first in very small quantity, increasing it gradually.

By this treatment attacks of simple diarrhœa are usually easily cured. But it is very different with diarrhœa caused by infectious bacteria. Of these the most dangerous is dysentery. We told you last month how to guard against this epidemic, which attacks us every year in the early summer during the fly season—not, be it observed, in the hottest time of the year, when the epidemic usually subsides.

Babies Killed by Ignorance.

We hope that our advice will be carefully observed, and that it will save many lives. The cause of the increased sickness and more frequent deaths among our infants during the summer is not the hot weather; it is the prevalence of dysentery and other bowel infections during this season. This infection occurs so frequently because mothers do not know how the dysentery bacilli get into their babies. Babies have died from want of knowledge.

The Premature Baby.

Most people know that when a baby is premature—that is, born before its time—it needs special care and treatment, but many have little knowledge of the special points which require immediate attention, if the child is to have a reasonable chance of survival.

If even half of the premature babies who are born each year in Queensland could live, there would be a marked lowering of the infantile death rate. Of all the deaths that take place in children under one year, about half occur during the first month of life. A large number of these children are either premature, or feeble, weakly infants, who should receive the same care as those who are premature. Such cases should always be under the care of a doctor.

If a baby is under 5 lb. when born, it is better to treat it as premature, to get satisfactory results. Those under 2½ or 3 lb. in weight rarely survive, though cases are on record where infants of less than 2lb. have lived and developed into healthy children.

In appearance, the premature baby differs from the normal baby in more than size. The little body is very soft and limp; the skin wrinkled and downy, and because it is thinner than usual, it looks redder. All the muscles are weak, and the infant is often too feeble to suck. The cry is feeble and suggestive of the mewing of a young kitten. Often the baby cannot cry at all. Such cases need special care from the moment of birth.

FOUR IMPORTANT POINTS.

There are four points which should receive attention. They are prevention of chilling of the baby (that is most important and must come first); careful feeding, on mothers milk; careful avoidance of risk of infection; and avoidance of all unnecessary handling.

Prevention of Chilling.

Because the baby has come too soon into the world, the power of the body to manufacture and regulate its heat is not yet properly developed, and the temperature can quickly fall to a dangerously low level. A premature baby who is allowed to become thoroughly chilled soon after birth rarely lives. When we know that an infant is to be born prematurely, special preparation should always be made to prevent this chilling. A cot should be prepared and thoroughly warmed for its reception. Baby must not be bathed, nor yet even oiled, but, as soon as it is born, wrapped in warmed cotton wool or soft flannel and placed in the cot. At the end of six or eight hours it can be oiled over with warm olive oil and cotton-wool swabs, taking care to do it as quickly as possible and with as little handling of the child as possible. Very frail babies should be oiled without being removed from their cots, and the cot should be placed in a warm, sheltered place and protected from all draughts by screens while this is being done. In hospitals, special cots are kept for premature babies. These are not always available in private homes, but a very useful and comfortable cot can be quickly improvised. A dress basket does admirably; failing this, the family clothes basket can be used, or a drawer out of a chest of drawers can be made to serve, though this last is not deep enough to be as suitable as the two previously mentioned. To prepare the improvised cot: if the weather is cold, first line it with paper—newspaper does quite well—then throw a blanket over it, covering it completely. Next, in the bottom of the basket and over the blanket, place a pillow to serve as a mattress. A pillow-slip or flannelette napkin serves as a sheet, and a small, folded, soft napkin as a pillow. On this the baby,

wrapped in cotton wool and its soft woollen shawl, is placed with a baby blanket over it. The enveloping blanket is now drawn from each side across the cot, but this is not enough warmth for the premature baby. Hot water bags or bottles will be required. Rubber bags are best, but any bottles can be made to serve. In cold weather three are required, in warm weather two will probably be enough. One bag is placed under the mattress at the foot of the bed, and the others at the sides, not close to baby's body but lying on edge, tucked down between the enveloping blanket and the mattress. For the bottle at the foot of the bed use two-thirds boiling water and one-third cold water; for the side bottles use equal parts cold and boiling water. The bags must be refilled in rotation, one every hour in cold weather, less often in summer. Give baby plenty of fresh air—keep him in a well-ventilated room. In our Queensland climate, the air even in winter is not cold enough to hurt the premature baby, provided his bed is kept properly warm. Guard against over-heating. It is wise to have a dairy thermometer in the bed, and this should register between 85 and 95 deg. Fahr.; never more, or it will do baby harm. Gradually decrease the artificial heat as baby's condition improves. Oil baby every second day, taking the same precautions as for the first oiling. Do not put him in the bath until he weighs 5 lb. As he improves, commence with sponging, at first only hands and face, and gradually increase until he is being fully sponged, and later, bathed.

Careful Feeding.

For our premature baby, mother's milk is practically essential. Few survive without it. If circumstances make it impossible for the mother to feed her own baby, endeavour to get milk from another healthy mother. A relative can sometimes be found who has a baby of her own, and so is able to supply some breast milk. It does not matter at all if the foster-mother's milk baby is six or even more months old. It will not hurt the premature body, but it may sometimes be necessary at first to dilute the milk with equal parts of water. If the foster-mother is a stranger, or there is any doubt about her health, boil the milk before giving it to baby. Nothing but plain, boiled water should be given to the premature baby for the first twenty-four or thirty-six hours. After that it must have food. It is impossible to say exactly how much the child should have or how frequently it should be fed. Some strong premature babies can suck the breast and get all they need. Others are quite unable to suck, and at first almost unable to swallow. Such cases must be fed with a pipette or eye dropper, and the milk must be expressed from the mother's breasts and fed to the child. If baby can take very little, say only one or two teaspoonsful at a time, he must be fed every two hours, with one night interval of three hours. With a feeble baby, it may take twenty minutes or even more to take even this small quantity. Increase the interval between feeds by a quarter of an hour at a time, to three hours, with one longer night interval, as soon as baby can take a large quantity at a feed. Also substitute a small feeding-bottle for the eye dropper as soon as the child shows signs of sucking.

If mother's milk is unprocurable, whey may be tried, at first diluted to half strength, until advice can be obtained from a doctor or welfare nurse. A rough estimate of the amount of food that a premature baby should take is 3 oz. for each pound of body weight. So if baby weighs 3 lb., try to give him 9 oz. of fluid daily. He may take much less at first.

Prevention of Infection.

As a result of being undeveloped and weak, baby is very susceptible to infection. Because he is so tiny, he is generally an object of interest and curiosity to neighbours and friends who come to visit him. In his interest this should not be allowed. Even a common cold in an attendant or visitor can easily lead to a fatal pneumonia in a premature baby. For this reason isolate him as far as possible. Have no unnecessary visitors and as few attendants as can be. If mother or nurse develops a cold, she should tie a piece of gauze over her nose and mouth while attending to the child.

Avoidance of Handling.

Handling is very harmful to the feeble premature baby. Until he shows signs of increasing strength, do not remove him from his cot while feeding or oiling him. Handle as little and as gently as possible while changing him; but change of position is necessary; turn him from one side to the other every four hours. The care of a frail, premature baby entails not only much care and trouble, but a high degree of skill. The successful rearing of such an infant is justly a source of pride to mother or nurse.

Orchard Notes for February.

THE COASTAL DISTRICTS.

February in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkempt, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth-leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4½ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Where there are facilities for cyaniding, this is a good time to carry out the work, as fruit treated now will keep clean and free from scales till it is ready to market. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertiliser, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of peaches and plums and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice given in these notes for the two previous months with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying with arsenate of lead will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

Farm Notes for February.

Reference was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River) wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible

presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish Blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig-raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

QUEENSLAND SHOW DATES, 1931.

Stanthorpe: 4th to 6th February.
Allora: 18th and 19th February.
Killarney: 27th and 28th February.
Milmerran: 3rd March.
Pittsworth: 5th March.
Warwick: 10th to 13th March.
Toowoomba: 23rd to 26th March.
Oakey: 11th April.
Dalby: 15th and 16th April.
Chinchilla: 21st and 22nd April.
Taroom: 4th to 6th May.
Boonah: 6th and 7th May.
Murgon: 8th and 9th May.
Ipswich: 12th to 15th May.
Mitchell: 13th and 14th May.
Kilkivan: 20th and 21st May.
Biggenden: 21st and 22nd May.
Wowan: 4th and 5th June.
Lowood: 19th and 20th June.
Mount Larcom: 19th and 20th June.
Rockhampton: 23rd to 27th June.
Kilcoy: 2nd and 3rd July.
Cleveland: 10th and 11th July.
Rosewood: 17th and 18th July.
Ithaca: 18th July.
Royal National: 10th to 15th August.
Wynnum: 28th and 29th August.
Imbil: 2nd and 3rd September.
Beenleigh: 18th and 19th September.
Rocklea: 26th September.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	January, 1931.		February, 1931.		MOONRISE. Jan. 1931.	MOONRISE. Feb. 1931.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5.3	6.47	5.26	6.44	p.m. 3.38	p.m. 5.30
2	5.3	6.47	5.27	6.44	4.41	6.28
3	5.4	6.47	5.28	6.43	5.46	7.15
4	5.4	6.48	5.29	6.42	6.49	7.55
5	5.5	6.48	5.30	6.41	7.50	8.32
6	5.6	6.48	5.31	6.40	8.42	9.7
7	5.6	6.49	5.32	6.40	9.24	9.41
8	5.7	6.49	5.33	6.39	10.12	10.16
9	5.8	6.49	5.33	6.38	10.37	10.52
10	5.9	6.49	5.34	6.37	11.9	11.35
11	5.9	6.49	5.34	6.37	11.42	...
12	5.10	6.49	3.35	6.36	...	a.m. 12.22
13	5.11	6.49	5.36	6.35	a.m. 12.19	1.15
14	5.12	6.48	5.36	6.35	12.53	2.10
15	5.13	6.48	5.37	6.34	1.37	3.5
16	5.14	6.48	5.38	6.34	2.25	4.1
17	5.15	6.48	5.38	6.33	3.19	4.57
18	5.16	6.48	5.39	6.32	4.15	5.52
19	5.17	6.47	5.40	6.32	5.11	6.45
20	5.17	6.47	5.41	6.31	6.7	7.37
21	5.18	6.47	5.42	6.30	7.5	8.27
22	5.19	6.47	5.43	6.29	7.58	9.18
23	5.20	6.47	5.43	6.28	8.50	10.15
24	5.21	6.47	5.44	6.27	9.42	11.11
25	5.21	6.46	5.45	6.26	10.31	p.m. 12.10
26	5.22	6.46	5.46	6.25	11.26	1.10
27	5.22	6.46	5.46	6.24	p.m. 12.21	2.10
28	5.23	6.46	5.47	6.28	1.20	3.11
29	5.24	6.45	...	...	2.22	...
30	5.24	6.45	...	...	3.24	...
1	5.25	6.45	...	...	4.28	...

Phases of the Moon, Occultations, &c.

4 Jan.	○ Full Moon	11 15 p.m.
11 ,,	☽ Last Quarter	3 9 p.m.
19 ,,	● New Moon	4 36 a.m.
27 ,,	☾ First Quarter	10 5 a.m.

Perigee, 7th January, at 12.48 a.m.
Apogee, 22nd January, at 11.18 p.m.

Early in the morning of the 7th the Moon will pass apparently so close to Mars that it will cause an occultation of that planet at places north of Australia. It will afford an interesting sight, especially with optical aid, though the Moon will be rather too bright for the best view of such an occurrence in Queensland.

On the 27th Mars will reach that part of its orbit which will bring it to about 62,000,000 miles distant from the Earth; it will then be on the opposite side of it to the Sun.

Mercury will set at 7.29 p.m. on the 1st and rise at 3.59 a.m. on the 15th.

Venus will rise at 2.24 a.m. on the 1st and at 2.9 a.m. on the 15th.

Mars will rise at 9.15 p.m. on the 1st and at 8.7 p.m. on the 15th.

Jupiter will rise at 7.15 p.m. on the 1st and at 6.11 p.m. on the 15th.

Saturn will rise 38 minutes before the Sun on the 15th. For the earlier part of January the Southern Cross will be below the horizon when the Sun sets, only coming into view about 9 p.m. in the south-south-east with its head very much inclined downwards; at the end of the month this will occur two hours earlier.

3 Feb.	○ Full Moon	10 26 a.m.
10 ,,	☽ Last Quarter	2 10 a.m.
17 ,,	● New Moon	11 11 p.m.
26 ,,	☾ First Quarter	2 42 a.m.

Perigee, 4th February, at 8.24 a.m.
Apogee, 19th February, at 7.42 a.m.

Although an occultation of the planet Mars by the Moon will occur early in the evening of the 2nd, it will be hardly visible at all in Australia. South of Cooktown the planet will appear outside the disc of the Moon, the distance increasing with southern latitude.

Neptune, which can no longer be called the most distant planet from the Earth and Sun, will be in opposition to the latter on the 23rd. It will then be more than 2,786 million miles from the Earth, while the Sun will be barely 92 million miles distant. The earth, which will be nearly on a line between the Sun and Neptune, will have Neptune rising as the Sun sets. It will be about 5 degrees eastward of Regulus, the principal star of Leo. Only possessors of telescopes will be able to locate Neptune, which merely has the appearance of a small star.

Venus and Saturn will appear to be very near to each other, especially on the 25th. As they will rise about 2 a.m., some 20 degrees south of east, these fine planets will form an interesting spectacle in the early hours of the morning near the end of the month.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/- including postage.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXV | 1 FEBRUARY, 1931. | PART 2.

Event and Comment.

Fat Lamb Raising.

MORE attention is being given to fat lamb raising in Queensland, and there is no reason why this branch of the pastoral industry should not be greatly extended in those districts where climate, pastures, and other conditions are favourable. The present position of wool growing suggests that farmers on comparatively small holdings should consider more closely the commercial possibilities of the carcass as against the fleece. The success of lamb raising in Queensland in suitable environment and with sound flock management has already been proved, and with the opening of the new metropolitan abattoirs the risk of an over-supplied market will be considerably reduced.

Generally speaking, however, our natural pastures are not altogether suitable for fattening lambs, but that these pastures can be greatly improved has been demonstrated conclusively in many places. On land more or less within the coastal country and that carried formerly a heavy growth of jungle, introduced grasses have been found quite suitable for lamb fattening. It is advisable to supplement ordinary grazing with cultivated crops the production of which may be regulated to supply any anticipated deficiency in feeding values, for seasonal influences, as with other branches of husbandry, are a very important factor.

Sheep on Small Holdings.

FAT lamb raising should be combined with mixed farming, and anyone so engaged may expect from sheep a remunerative return. Assuming that an established farmer has his cultivation paddocks enclosed with ordinary stock-proof fences, he would be able to make them sheep-proof with wire netting at a cost of something like £30 a mile. Paddocks of 20 acres or less are suitable. Sheep may be turned in immediately after harvest. They will do all the gleaning and clearing required, obviate the necessity in some cases of burning off before re-ploughing, and leave

the land in better condition for subsequent cropping. Cultivation is one of the best means of converting a worm-infested paddock into worm-free country, and worms are one of the worst plagues to the sheep man in the coastal or near-coastal areas, and even further inland, especially in years of heavy summer rains.

When the weight and probable price of the farmer's wool are taken into account, a fair margin of profit should be revealed. Should the lambs be sold when five months old at anything like current market rates, a flock return of something around 10s. a head could be expected.

Farmers' Flocks.

THE Corriedale is a very suitable farmers' sheep, being big, well-proportioned, possessing a strong constitution, with a plentiful milk secretion, combined with a capacity for producing a weighty fleece of about 54s to 56s spinning counts. It is an admirable dual-purpose animal, an essential in the farmer's breeding flock. Discussing this subject, Mr. Carew (Instructor in Sheep and Wool) says that as the Corriedale is not suitable for producing fat lambs it is necessary to mate the ewes to a breed of ram likely to give the best results, and, despite the claims made on behalf of other breeds, rams of the Dorset Horn or Border Leicester breeds are recommended for the higher and well-drained areas within, say, 50 to 150 miles from our sea-board.

If the Corriedale breed is not procurable, or if for any other reason the sheep farmer wishes to raise his own breeding flock, full consideration must be given to geographical, climatic, and general conditions. The Corriedale is based on being fifty-fifty Lincoln and Merino. Therefore, Lincoln rams mated with Merino ewes will give a suitable type, but would probably be composed of a big percentage of rough-covered ewes that would greatly reduce the value of the clip. The Corriedale, which has been developed by careful selection, is composed of a more even type. Should the Lincoln-Merino first cross be used as the breeding flock, the purebred Lincoln ram will not produce lambs to mature as quickly as the Border Leicester or Dorset Horn; therefore, by introducing two breeds of rams, complications are being constituted unnecessarily. Should the holding be within 50 miles of the coast, with low-lying as well as elevated ridges, either the Romney Marsh or Romney cross as the breeding flock is recommended. On the higher and better drained areas the Border Leicester crossed with the Merino can be recommended as likely to give the best results all round. The first cross will be quick to mature. The wether lambs should be fit for market when four and a-half to five months old. The first cross ewe lambs should be retained as breeders, being very suitable both as wool and mutton sheep, growing to a good size, possessing plenty of vigour, capable of a quick recovery after a pinch, having a good milk secretion (which is so important in securing early maturing lambs), and being prolific; all these characteristics, combined with the quality of adapting themselves to the varied diet usually supplied on a mixed farm, help to secure for them a position amongst farmers' sheep that is difficult to displace. These half-bred ewes can be mated again with the pure Border Leicester ram, but, as the result of this mating, it is recommended that all this drop be sold as fat lambs as soon as fit, as the ewes from this cross are on the coarse side in regard to wool production.

It will, therefore, be understood that only one pure breed of ewe and one pure breed of ram is necessary—that is, the Merino and Border Leicester. This will simplify matters considerably, as all the breeding ewes may be run in one flock during the whole year.

The Dorset Horn is a very desirable breed for the fat-lamb trade, but as they are not so valuable as wool producers and do not possess any distinct advantage over the Border Leicester as a fat-lamb getter there appears to be no reason why they should be used instead of the Border Leicester and Merino cross.

Assuming then that this is the cross to be used, we find that the Merino is suitable to be mated either in spring or autumn, but the Border Leicester-Merino cross will only mate successfully in autumn. For the purpose of getting fat lambs

it is better to keep the rams away from the ewes except at mating time. Seeing that the autumn is the only season in which a good mating can be expected, rams should be put with the ewes from the second week in February to the last week in March. The lambing will thus commence in the middle of July and finish the last week in August.

Care of the Lambing Ewe.

AT the time of mating, the ewes should be kept on good and suitable natural pasture. If the season be good, they will probably be attacked by the sheep maggot fly, but at this season the ewes can stand the knocking about that is necessary for crutching, jetting, &c., to keep them free. If stomach worms are present they are worst at this season. Against that, however, is the fact that at this season the sheep should be better able to withstand the evil effects, due to the feed being more suitable and nutritious.

When winter comes the sheep should be practically free from worms, and the ewes can go right through the lambing without disturbance, as flies also are, as a rule, absent at this period. By the time the flies begin to get busy the lamb marking should be over, as the most suitable time to mark lambs is when they are from two to six weeks old. The flock will be fit for shearing by the end of September or early October. The shearing has a retarding effect on the attack of the fly, especially if all sheep are jetted as they go through the race after shearing.

The sheep at shearing time should be examined for broken mouth and specially marked to be fattened off. The broken-mouthed ewes may be fattened off with the lambs and sold while they are still capable of improving condition. When the lambing is timed to take place in July and August provision should be made for a supply of feed for the whole batch, as the more quickly they are fattened the more economic the fattening.

If lucerne is grown on the holding it will show little growth during July and August. If cut in June, the short growth during July and August is very suitable for grazing sheep, on which they will do well, thus giving the lambs a good start. Up to the time the lamb is dropped the ewes should be kept going, but should not be put on luscious feed. After the lambs are dropped, the best and most luscious is not too good, and for grazing purposes lucerne is among the best.

There are other crops, however, that are suitable and that may be grown during our normal autumns and winters, such as oats, barley, wheat, turnips, rape, &c. The last mentioned gives the best results for fattening purposes. If sown in April and May it will be suitable for feeding during August, September, and October. For feeding during November and December, lucerne is about the best: failing this, Sudan grass or one of the panicums will fill the bill and top off all the lambs by the end of January or the middle of February.

Increase in Dairy Production.

IT is particularly gratifying to note not only the large increase in production of dairy products in this State which has taken place, but the vast improvement which has been effected in the quality of our produce, said the Minister for Agriculture and Stock (Hon. H. F. Walker) in a recent interview.

Dairy farming is an important factor in the progress of the State. Favourable seasonal conditions add materially to our wealth, and the outlook for the current season gives promise of a record in production of dairy products. In the modernisation of dairy factory buildings and equipment much activity has been maintained during recent years, and it is heartening to note the optimism of our primary producers as is evidenced in the building of new and the modernising of existing factories. That this activity has been justified is apparent from the large increase in the quantity of choice grade butter being submitted to the State grading officers throughout the present season. The total gradings from July last show an increase in the percentage of choice butter of over 100 per cent.

Notwithstanding the reduction of values on the London market the contribution of the dairy farmers in balancing our overseas trade will prove of substantial value.

Bureau of Sugar Experiment Stations.

HISTORY OF THE QUEENSLAND SUGAR INDUSTRY.

It is with much regret that the Director of Sugar Experiment Stations, Mr. H. T. Easterby, finds that, through illness, he is unable for the present to continue the "History of the Queensland Sugar Industry," but hopes, however, to be able to resume this at an early date.

CANE PESTS AND DISEASES.

Mr. Buzacott, Assistant to the Entomologist at Meringa, has forwarded the following report on insect pests affecting cane in the Burdekin district to the Director, Mr. H. T. Easterby:—

The Lower Burdekin district was visited during November and a collection of the insects occurring in the district during the month was made, and further data relative to pest control collected.

At the date of the visit insufficient rain had fallen to enable the greyback beetle to escape from the ground, so it was impossible to determine the size of the beetle flight or estimate the probable damage next year.

Giant Termite.

The damage caused by this pest was very much in evidence in young plant cane on several farms. Where extensive poisoning of trees and fences has been carried out for a number of years, however, the damage has been considerably diminished. In order to help growers as much as possible to combat this pest it has been decided to recommend to the Lower Burdekin Pest Destruction Board to purchase a number of drums of carbon bisulphide to be distributed among growers troubled by this pest. The method of using it is to treat all badly infested fence posts or trees near the affected cane by boring a hole with an auger through the wood and well into the matrix of the nest. Into this hole is poured half a pint to 1 quart of carbon bisulphide according to the size of the nest, and the hole is then plugged up again. It is also a good plan to follow this treatment by pouring a little commercial creosote in the same hole to prevent infestation of the stump at a later date. After having freely poisoned stumps and trees round the headland, if patches in the cane are still affected, it is usually fairly easy to trace out the source of infestation of these patches by following the course of the infested area to the headland and looking for a nest in any of the posts or trees near by. If this method be carried out it is possible to practically eradicate the troublesome termite from the cane.

Among the insects bred and collected during the fortnight spent in the district were several specimens of scoliid wasps and some species of robber-flies, all of which are factors in the control of scarabæid grubs. The total collection provided a fairly comprehensive group of the insects flying in Ayr during November.

USE OF LIME BY CANEGROWERS.

With the very encouraging results which have been obtained in North Queensland during the past year or two, following the application of lime on acid soils, we are constantly receiving inquiries from interested growers for advice as to whether their land would benefit from the use of this material.

For the guidance of growers interested in this subject, we would offer the following advice. Before purchasing lime for your land, take a soil sample of your block and forward it to us for a test of its lime requirement. The sample taken should be representative of the soil on the block, and therefore a portion of the surface soil to plough depth should be taken at several points in the field, and the whole thoroughly mixed. A sample of this mixed soil of about 1 pound weight should be placed in a suitable container, labelled with the name of the grower. A note from the latter despatched at the same time as the sample should state that advice on the lime requirement of the soil is desired.

Growers in the Northern areas should forward their samples to the Chemist in Charge, Sugar Experiment Station, South Johnstone. Farmers in those districts south from Townsville should address samples and correspondence to the Director, Bureau of Sugar Experiment Stations, Department of Agriculture, Brisbane.

BARLEY AS PIG FOOD.

Climatic conditions throughout the cereal-producing districts during the past season were distinctly favourable, but although the original estimate of Australia's total grain production has not been realised, the harvest was a record one. Owing, however, to the parlous state of the grain export trade, increased production has given rise to what may be termed a "grain glut," and the stockowner has an opportunity of taking advantage of the low prices ruling for cereals for fattening purposes where economically possible.

A SURPLUS OF BARLEY.

QUEENSLAND has recently produced a substantial surplus of barley, for which, unfortunately, there exists but a very limited export outlet. The local market for this grain for malting purposes is also restricted, and the financial depression is responsible for decreased human consumption of malt products.

An Excellent Stock Food.

It is as a stock food, therefore, that immediate attention is being drawn to the value of barley, and in this connection the possibility of extending the frozen pork trade to markets ordinarily largely supplied with barley-fed pigs, is emphasised, for barley is an excellent grain for raising and fattening pigs. Barley-fed pork, bacon and ham, are of the highest quality, fine-grained, and streaky and, like dairy-fed pork, command top price in the best markets of the world.

In Queensland it often happens that maize and its products are actually lower-priced and therefore usually considered better food. Wheat is also often used more extensively, but neither of these facts detract from the high-feeding value of barley, especially at present low prices and where it is fed in combination with more bulky farm-grown foods. The late maize crop in Queensland is not likely to be a heavy one, and this grain is already higher-priced than barley or barley meal.

Barley Meal.

Unless otherwise arranged, the barley to be made available for stock food will be in the form of barley meal, for it is inadvisable to feed this grain in the whole dry form. The meal may be fed dry in a separate trough, or may be soaked in hot or cold water or cooked, and be fed with milk and other farm-grown foods available. The proportion of barley meal to use will vary in accordance with the other available foods, suitable grain rations being—

(1) Barley meal alone.
(2) Barley meal, 5 parts; wheat meal or pollard, 4 parts.
(3) Barley meal, 3 parts; maize meal, 3 parts; pollard or wheat meal, 3 parts.

A proportion of grain mixture to be fed in conjunction with skim milk or other dairy products and/or green lucerne, lucerne hay, or chaff (soaked), potatoes, pumpkins, and green stuff. Use more milk and green foods with very young pigs and more grain as the pigs approach the fattening stage, for young pigs require more protein (flesh formers) than carbohydrates and fats (fat formers). If no skim milk, lucerne, or other protein foods are available on the farm, from 5 to 10 per cent. of meat or protein meal could, with advantage, be added to the grain ration.

Barley meal carries approximately 10 to 12 per cent. crude protein, 4 to 6 per cent. crude ash and fibre, 1 to 2 per cent. crude fat, 65 to 66 per cent. carbohydrates, and about 14 per cent. moisture. Maize invariably carries a higher fat content (about 4 per cent.) and is therefore used more freely by pig farmers (often too freely) in the fattening stages, with the result that many corn-fed bacon pigs reach the factories in an overfat condition. To check this tendency the combination of barley and other grains, and meat or protein meal, is again suggested.

One advantage in the feeding of barley meal over pollard is that the whole of the grain is fed when barley is used, whereas in the milling of wheaten flour, the bran and pollard are regarded as by-products, of less value, commercially than flour.

Further particulars as to the use of barley meal for other classes of stock, and price per cwt., or ton, may be obtained on application to the Department of Agriculture and Stock, Brisbane, or to the produce merchants handling this line.

CLIMATOLOGICAL TABLE—DECEMBER, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·89	88	75	95	20	70	26	509	11
Herberton	..	81	63	89	17, 20, 29, 30	59	3, 16, 26, 31	800	11
Rockhampton	29·95	89	69	98	31	64	28, 30	244	12
Brisbane	29·99	85	65	92	18	58	29	194	7
Darling Downs.									
Dalby	29·96	88	61	97	31	49	29	158	5
Stanthorpe	..	81	54	94	23	43	27, 29	208	9
Toowoomba	..	81	57	92	31	49	28, 29	202	6
Mid-interior.									
Georgetown	29·86	96	70	101	31	58	30, 31	289	8
Longreach	29·86	98	72	107	21	59	28	24	3
Mitchell	29·92	90	64	99	21, 22, 23, 31	48	29	82	4
Western.									
Burketown	29·85	92	75	101	31	64	28	574	7
Boulia	29·83	100	73	111	22	64	28, 29	126	5
Thargomindah	29·88	90	70	103	13, 14, 22	59	28	229	8

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING DECEMBER, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Dec.	No. of Years' Records.	Total Rainfall. Dec. 1930.	Dec. 1929.
North Coast.	In.		In.	In.
Atherton	7·57	29	4·50	3·43
Cairns	8·63	48	8·59	5·99
Cardwell	8·16	58	5·03	1·66
Cooktown	6·77	54	5·09	1·64
Herberton	5·71	43	8·00	5·09
Ingham	6·84	38	5·29	1·13
Innisfail	11·61	49	8·16	0·76
Mossman	11·13	17	8·63	5·42
Townsville	5·52	59	0·89	2·19
Central Coast.				
Ayr	3·92	43	1·73	1·53
Bowen	4·44	59	2·14	2·99
Charters Towers ..	3·52	48	0·35	2·12
Mackay	7·32	59	2·37	3·30
Proserpine	8·11	27	3·69	1·05
St. Lawrence.. ..	4·72	59	2·59	1·04
South Coast.				
Biggenden	4·64	31	1·56	1·92
Bundaberg	4·99	47	2·25	6·24
Brisbane	4·86	79	1·94	1·90
Caboolture	5·22	43	2·91	4·23
Childers	5·66	35	1·82	1·84
Crohamhurst ..	7·17	37	2·19	8·91
Esk	4·69	43	3·06	4·18
Gayndah	4·13	59	3·18	2·04
Gympie ..	6·05	60	2·45	3·13
Kilkivan	4·57	51	1·56	3·27
Maryborough ..	4·73	58	1·86	2·45

Divisions and Stations.	Average Rainfall. Dec.	No. of Years' Records.	Total Rainfall. Dec. 1930.	Dec. 1929.
South Coast—continued:	In.		In.	In.
Nambour	6·90	34	3·05	8·05
Nanango	3·87	48	1·55	4·03
Rockhampton ..	4·75	43	2·44	2·40
Woodford	5·72	43	1·49	6·69
Darling Downs.				
Dalby	3·24	60	1·51	4·50
Emu Vale	3·55	34	1·23	2·05
Jimbour	3·26	42	2·07	4·66
Miles	3·02	45	2·08	5·89
Stanthorpe	3·54	57	2·08	3·36
Toowoomba ..	4·35	58	2·02	3·32
Warwick	3·43	65	1·38	2·74
Maranoa.				
Roma	2·49	56	0·40	2·39
State Farms, &c.				
Bungeworgorai ..	3·00	16	1·10	1·74
Gatton College ..	3·60	31	1·42	2·39
Gindie	3·00	31	0·34	2·36
Hermitage	3·02	24	1·36	2·22
Kairi	6·36	16	..	1·39
Mackay Sugar Experiment Station ..	8·73	33	3·21	2·73
Warren	3·70	15	..	1·73

GEORGE. G. BOND, Divisional Meteorologist.

IN MEMORIAM.

HON. W. T. PAGET.

The death at his home at Mooloolah on 23rd December of Mr. Walter Trueman Paget removed one who, in his day, played a very prominent part in the public life of Queensland, and in the development of the sugar industry. Mr. Paget was born in London in 1854, and came to Queensland in January, 1873. Soon after his arrival in this State, then a colony, he went to Mackay, and became one of the pioneers of the sugar industry. Farming at that time was not easy by any means, but Mr. Paget found time to give attention to the requirements of his district. He became chairman of the Pioneer Divisional Board, a member of the Mackay Harbour Board, vice-president of the Mackay Hospital, and president of the Mackay Sugar Board.

In May, 1901, after the death of the late Mr. J. V. Chataway, Mr. Paget was elected member for the district as a supporter of the Government of the late Sir James R. Dickson. He signed the roll of Parliament on 16th July, 1901, and remained member for Mackay until his retirement from politics in April, 1915. From October, 1908, until February, 1911, he held the joint portfolios of Minister for Railways and Agriculture, and from February, 1911, until April, 1915, he was Minister for Railways. In his seven years at the Railway Department Mr. Paget commenced more railway lines and opened more new railways than, perhaps, any other man in the history of Queensland.

In Parliament (for many years he was Chief Whip of the Philp Government Party) he had the rare gift of immeasurable patience. He gave up his time and his energies to his Parliamentary duties, and night after night, in sessions before there was a time limit on speeches, Mr. Paget would listen for hours to the speeches, frequently being the only occupant of the Opposition benches. He sought no place for himself. When he was asked to accept the portfolio of Agriculture and Railways he was induced to take the office by his two old friends, the late Sir Robert Philp and Mr. Digby F. Denham, who always remained one of his closest friends. But his long apprenticeship served him in good stead. He emerged from the comparative obscurity of a private member to the front rank of the political battle, equipped with long experience, with full knowledge of the procedure of Parliament and of the Departments, and familiar with every departmental chief. He had a particular gift of humour that was often regarded by his opponents and by those who did not know him well as cynicism. But the cynicism was a masquerade because those who knew him well knew that he was extremely sensitive, that he was endowed with a spacious tolerance, and had a very anxious solicitude for the people of his district and of the State. In spite, however, of his fourteen years in Parliament he was not primarily a politician.

He Loved the Land.

He loved the land with a passionate intensity, and having secured a large area at Mooloolah on the North Coast, he used to depart every Friday night for that place and spend the week-end clearing and preparing his holding for his future home, thoroughly enjoying himself. Later, when he left Parliament, immensely relieved at being able to throw off the responsibilities of public life, he devoted himself to the development of his property. About three years ago Mr. Paget suffered very greatly from almost complete loss of eyesight, but he endured the affliction with amazing

courage. He loved his home and his family, seldom visited the city, and when he came to town he probably returned the same day after what he used to call "an enjoyable pitch" with Mr. Denham and a few other old friends. Mr. Paget is survived by his widow, two daughters (Mrs. C. B. Paul, of Mooloolah, and Miss Paget, of Townsville), and two sons (Walter and A. H. Paget), of the Stanthorpe district.

The funeral, which moved from his home to the Mooloolah-Glenview Cemetery, was well attended. Hon. Harry F. Walker (Minister for Agriculture and Stock) represented the Government, and the Railway Department was also represented.

Tributes.

The Hon. Digby Denham, a former Premier of Queensland and also Minister for Railways, expressed extreme regret at the passing of Mr. Walter Paget. Mr. Paget, he said, had been ailing for a long time, and he had just received private advice that he had died of a stroke. Mr. Denham added: "I have been associated with the late Mr. Walter Paget in political life for many years, sometimes as Whip of the party, and other times as Minister, and I can say that whatever duty he was attached to, he performed it most faithfully and thoroughly. I had the highest regard for him, having worked with him as a colleague, and never had occasion to regret the confidence I reposed in him. He was a fine friend."

Mr. E. B. Swayne, M.L.A., who was associated with Mr. Paget for some years as a joint representative for Mackay, when it was a double-member electorate, and afterwards as the member for the adjoining electorate of Mirani, said in the course of a personal tribute: "I had every opportunity for noting his energy and self-sacrificing spirit in the performance of his public duties. But more particularly in the North should his memory be valued in connection with that great national work, the North Coast Railway to Cairns. When Mr. Kidston, in 1910, floated his loan for railway building, the linking up of our Western termini being principally in his mind, Mr. Paget, as his Minister for Railways, put in his claim for the North. It was acceded to, and, soon after, work commenced, and was continued as speedily as circumstances permitted, by the linking of small railways already in existence on the route, and construction north from Rockhampton. But there were occasions when work such as expensive key bridges had to be tackled, and I think I am right when I say that Mr. Paget's determination on such occasions saved the North years of delay in the completion of our railway."

Mr. L. L. Larke, of Mooloolah, added the following tribute as a friend and neighbour: "The late Mr. Paget had a remarkable personality, and a gift of endearing himself to all who were so fortunate as to come into close contact with him. With a brilliant mind, and a clarity of view possessed by few, the deceased gentleman did noble service to the State of Queensland, both in public life, and in the great sugar industry of North Queensland. It is many years since he retired from the position of Minister for Railways, but he was affectionately remembered and honoured by the employees of the Department. That recollection was a testimony to the esteem in which he was held by the service of which he had been political head for many years. The sugar industry, too, has much to thank him for; in fact, it would be difficult to estimate what he did for that industry in its pioneering years. The large and representative gathering at the last sad rites was a fitting tribute to his memory and worth, while expressing the deep sympathy felt by all for the widow and children."

PLATE 34.—THE LATE WALTER TRUEMAN PAGET.
Minister for Agriculture and Stock, Queensland, October 29, 1908, to February, 1911.

FIELD WHEAT CROP COMPETITION, 1930.

By H. C. QUODLING, Director of Agriculture; and C. S. CLYDESDALE, Instructor in Agriculture.

Following are the awards in the Field Wheat Crop Competition, 1930 *Season:—*

TOOWOOMBA DISTRICT.

First.—Mrs. K. McGlynn, Pampas. "Clarendon" wheat, estimated to yield 46 *bushels per acre. Points awarded,* 127.5.

Second.—Mr. Chas. Town, Kaimkillenbun. "Novo" wheat, estimated to yield 42 *bushels per acre. Points awarded,* 117.5.

Third.—J. and J. Lemon, Cambooya. "Duke of York" wheat, estimated to yield 34 *bushels per acre. Points awarded,* 116.0.

WARWICK DISTRICT.

First.—Mr. R. S. Young, Freestone. "Three Seas" wheat, estimated to yield 45 *bushels per acre. Points awarded,* 123.5.

Second.—Mr. Edward Kyle, Ellangowan. "Pusa" wheat, estimated to yield 44 *bushels per acre. Points awarded,* 119.0.

Third.—Mr. F. Armstrong, Pilton. "Pusa" wheat, estimated to yield 42 *bushels per acre. Points awarded,* 116.5.

Champion .. .. .. Mrs. K. McGlynn, Pampas.

Reserve Champion .. .. Mr. R. S. Young, Freestone.

ARRANGEMENTS for the holding of the competition were not completed before August last, when representatives of the Department of Agriculture and Stock and of the four Agricultural Societies concerned met in conference at the Royal National Association's Council Rooms, Brisbane. The societies represented were: The Royal National Association, Brisbane; the Royal Agricultural Society, Toowoomba; the Eastern Downs Horticultural and Agricultural Association, Warwick; and the Maranoa Pastoral and Agricultural Association, Roma.

Entries.

Severe frosts on 16th and 17th August in the Roma district damaged a number of promising crops. Insufficient entries were forthcoming. This led to the withdrawal of the Maranoa Pastoral and Agricultural Association from the competition.

The entries in the Toowoomba and Warwick districts constituted a record, 133—fifty-two in the former, and eighty-one in the latter. There were, however, thirty-four withdrawals, seventeen from each district. The withdrawals were due in the main to rust and frost, and in a few instances to heavy wind storms, and one to hail.

Choice of Varieties.

The more popular varieties in the Warwick competition were Pusa, Clarendon, Duke of York, and Florence, with sixteen, thirteen, nine, and seven crops respectively.

A somewhat similar position was met with in the Toowoomba contest. Here, however, there were seven crops each of Pusa and Florence, six of Clarendon, and five of Duke of York.

Prolificacy.

The three highest yielding crops were: Clarendon, 46; Three Seas, 45; and Pusa, 44 bushels respectively. It is a remarkable fact none of these crops were fertilised.

Average Yields.

The average yield in the Warwick District Competition was 34 bushels per acre (sixty-four entries), and in the Toowoomba district 32.8 bushels (thirty-five entries).

Individual Variety Yields.

Taking the four popular varieties, the yields were as follows:—

Clarendon	36.8 bushels per acre.
Pusa	35.6 bushels per acre.
Florence	35.2 bushels per acre.
Duke of York	29.0 bushels per acre.

Conditions of the Competition.

Conditions of the competition were practically the same in each district, the entrants being called upon to furnish information under the following headings:—

Character of soil on which crop was to be grown.

Variety and amount of seed sown per acre.

Date of sowing and whether seed was sown before or after rain.

Rainfall.

The number of wheat crops that had been grown on the same land continuously in immediately preceding years.

Kind of crop grown previous to the competition crop. Rotation followed.

Treatment of land by cultivation.

Kind and quantity of fertiliser used.

Treatment of seed for bunt and smut.

Basis of Judging and Allotment of Points.

The area of the competing crop was to be 15 acres, which, however, might be any part of a larger area. Points were allotted for—

1. Apparent yield.—One point for each bushel up to 24 bushels; half point for every additional bushel.
2. Trueness to type and purity .. .. 20 points.
3. Freedom from disease .. .. 30 points.
4. Evenness of crop .. .. 20 points.
5. Condition .. .. 10 points.
6. Cleanliness .. .. 20 points.

Rainfall.

Difficulty was experienced in obtaining accurate and comparable records from the respective competitors, consequently official records of ten representative centres on the Darling Downs were secured from the Officer in Charge of the Commonwealth Meteorological Bureau in Brisbane (Mr. Bond), who courteously supplied the following tables:—

RAINFALL FOR 1930.

Station.	Rainfall for 1930.	Average over long period.	Difference for comparison.	Jan. to April, 4 months.	May to Oct. Growing period of wheat — six months.	Nov. to Dec., 2 months.
Dalby ..	26·14	25·75	+ 0·39	9·69	12·06	4·39
Milmerran ..	22·31	24·86	— 2·55	4·48	14·22	3·61
Pittsworth ..	23·52	28·13	— 4·61	8·65	11·94	2·93
Oakey ..	24·30	23·99	+ 0·31	8·88	11·08	4·34
Toowoomba ..	40·82	36·48	+ 4·34	11·08	22·48	3·33
Clifton ..	28·99	23·86	+ 5·13	11·04	15·62	2·33
Allora ..	28·18	26·95	+ 1·23	8·87	16·29	3·03
Warwick ..	22·33	27·67	— 5·34	5 93	14·11	2·28
Yangan ..	21·94	23·99	— 2·05	5·93	13·05	2·96
Killarney ..	26·82	28·83	— 2·01	7·23	17·52	2·07

MONTHLY RAINFALL FOR 1930, WITH NUMBER OF WET DAYS.

Station.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total for Year.	Average for Long Period.	No. of Years.
Dalby	386	123	262	198	221	236	302	250	92	105	281	158	26·14	25·75	60
Number Wet Days ..	14	8	5	7	7	10	7	5	6	8	5	5	87	..	..
Milmerran	74	62	81	231	264	197	321	231	96	313	263	98	22·31	24·86	30
Number Wet Days ..	3	3	4	5	4	7	6	5	4	7	2	4	54	..	..
Pittsworth	255	111	197	302	207	291	303	170	92	131	121	172	23·52	28·13	43
Number Wet Days ..	7	4	8	6	6	9	7	7	4	9	3	4	74	..	..
Oakey	234	199	150	305	199	276	274	101	134	124	202	232	24·30	23·99	31
Number Wet Days ..	10	4	4	6	5	8	7	5	4	9	4	6	72	..	..
Toowoomba	649	426	168	258	550	831	255	173	147	292	131	202	40·82	36·48	58
Number Wet Days ..	18	10	12	7	13	17	8	6	5	9	4	6	115	..	..
Clifton	265	220	262	357	262	568	313	114	149	156	131	102	28·99	23·86	33
Number Wet Days ..	7	6	7	8	7	10	6	6	4	7	4	3	75	..	..
Allora	315	262	144	165	240	465	301	130	128	365	152	151	28·18	26·95	47
Number Wet Days ..	9	7	6	6	6	12	7	7	5	9	5	5	84	..	..
Warwick	203	205	125	61	286	323	299	113	133	257	90	138	22·33	27·67	65
Number Wet Days ..	7	6	6	6	7	10	6	5	4	8	4	5	74	..	..
Yangan	203	122	160	108	261	417	142	122	112	251	187	109	21·94	23·99	18
Number Wet Days ..	6	6	7	8	6	9	5	5	4	7	3	3	69	..	..
Killarney	203	155	112	253	346	501	239	94	110	462	64	143	26·82	28·83	40
Number Wet Days ..	14	8	12	10	13	22	7	5	4	10	4	5	114	..	..

Plate 35.—Mrs. K. McGlynn, of Pampas, had a fine field of "Clarendon" Wheat. First prize Toowoomba District Competition and winner of Grand Championship. Mr. Jack McGlynn and daughter Joan in the foreground.

" Oh, I am the grass that has conquered man,
I am the King that is Bread!
Your armies and fleets are but fragile things
That await a nod of my head."

Plate 36.—Mr. R. S. Young, of Upper Freestone, gained First Prize in the Warwick District Competition and Second in Grand Championship for this field of "Three Seas."

" I am a song that the need of man has sung
From the soil at his feet."

PLATE 37.—MESSRS. J. AND J. LEMON'S, FINE CROP OF "DUKE OF YORK" AT CAMBOOYA.

Third prize Toowoomba District Competition.

PLATE 38.—MR. F. A. ARMSTRONG, PILTON, AND HIS PADDOCK OF "PUSA."

Third prize Warwick District Competition.

"Leave the hustle all behind you; come an' let contentment find you
In a cosy little cabin lyin' snug among the wheat."

Plate 39.—Mr. W. J. Lloyd's paddock of "Pusa" at Harrow.

"Food-giver, keeper and saviour of life
I am the grain that is wheat."

Plate 40.—Mr. Colin McCallum's field of "Florence" on Kincora, Pittsworth.

". . . A pleasure in a measure for a man who likes the game."

PLATE 41.—MESSRS. R. M. AND J. H. ANDERSON'S CROP OF "CLARENDON" AT SOUTHBROOK.

"Wheat, wheat, wheat! Oh, the sound of it is sweet!
I've been praisin' it an' raisin' it in rain an' wind an' heat
Since the time I learned to toddle, till it's beatin' in my noddle
Is the little song I'm singin' you of wheat, wheat, wheat."

PLATE 42.—A CROP OF "FLORENCE" ON MR H. E. LUCK'S FARM AT CAMBOOYA.

"Over the face of your rolling hills, over your plains afar,
I have strung you a necklace of gold to wear . . ."

Plate 43.—Mr. J. J. Hartnett had a fine stand of "Florence" at Freestone.

"For growin' things . . . . it makes life sort o' sweet
An' your conscience never swats you if your game is growin' wheat."

Plate 44.—This Crop of "Duke of York" on Mr. F. T. Keable's Farm at Tannymorel was also among the commended.

Plate 45.—Messrs. Carey Bros.' fine stand of "Clarendon" at Canning Downs Well.

". . From God's earth His gift of wheat."

Plate 46.—"Clarendon" Wheat on Mr. C. Gustafson's Farm at Tannymorel.

"Sowin' things an' growin' things, an' watchin' of 'em grow."

PLATE 47.

MR. W. P. CANNING, OF YANGAN, WAS ANOTHER SUCCESSFUL GROWER OF "PUSA."

"· · · · · · · a-keepin' of my feet,
While I cater for the nation with my wheat, wheat, wheat."

PLATE 48.—"CLARENDON" WHEAT ON MR. R. S. YOUNG'S FARM AT UPPER FREESTONE.

"Wheat, wheat, wheat! Oh, the people have to eat!
An' you're servin', an' deservin' of a velvet-cushion seat
In the cocky-farmers' heaven when you come to throw a seven;
An' your password at the portal will be wheat, wheat, wheat."

PLATE 49.
A CROP OF "CLARENDON" ON MR. R. C. HOLTHOUSE'S PROPERTY AT WESTBROOK.

"Realisin' he was wealthy in what makes a life worth while."

PLATE 50.—ANOTHER FINE CROP WAS THAT OF MR. W. H. TAYLOR, OF WESTBROOK, WHO SPECIALISED IN "PUSA."

"Of the world's great work he has done his share who has garnered a crop of wheat."

PLATE 51.—MR. M. STOWER, OF LINTHORPE, PITTSWORTH, DISCUSSES HIS CROP OF "FLORENCE" WITH MR. CHAS. CLYDESDALE, INSTRUCTOR IN AGRICULTURE.

". . . . . with a feelin' like content,
An' I feel like thankin' Heaven for a day in labour spent."

PLATE 52.—MRS. K. McGLYNN HAD ALSO A FINE STAND OF "PUSA" ON PAMPAS. Mr. Jack McGlynn and daughter Joan are in the picture.

Plate 53.—Horse-drawn, Engine-functioned Reaper-thresher at Work on Mr. J McMahon's Crop of "Florence" Wheat, Swan Creek.

"Then I come up bright an' grinnin' with the knowledge that I'm winnin',
With the rhythm of my harvester an' wheat, wheat, wheat."

"Life is sweet where grows the wheat."

Plate 54.—A Sunny Queenslander Happy on the Home Farm.

(Miss Hazel Doreen Redgwell, Junabee, *via* Warwick.)

FIELD WHEAT COMPETITION.

PARTICULARS OF THE TWELVE LEADING CROPS.

Following are the details of the leading crops:—

All seed wheat was "pickled" with approved fungicide before sowing.

Competitor.	Variety.	No. of Points.	Apparent Yield (Bushels).	Rate Sown per Acre. (lb.)	Sown. Date.	Sown. Before or after Rain.	Ploughed.	Cultivated with Springtooth S.T., Sundercut S.C., Stiffshank S.S.	Harrowed.	District.	Remarks.
Mrs. K. McGlynn ..	Clarendon ..	127·5	46·0	60	20-23 May	After ..	..	S.S. twice ..	Once, also rolled	Toowoomba	Fed off (sheep)
R. S. Young ..	Three Seas ..	123·5	45·0	60	May ..	After ..	January and April	S.C. once ..	Twice ..	Warwick ..	..
Ed. Kyle	Pusa ..	119·0	44·0	45	9 June ..	After ..	Once	S.C. once ..	Twice ..	Warwick ..	Fed off (sheep)
Chas. Town	Novo.. ..	117·5	42·0	44	25 May ..	After ..	..	S.C. five times	Once ..	Toowoomba	..
F. Armstrong ..	Pusa ..	116·5	42·0	50	June ..	After ..	January	S.C. thrice ..	Thrice ..	Warwick ..	..
J. and J. Lemon ..	Duke of York	116·0	34·0	60	2 May ..	After ..	..	S.C. once ..	Thrice ..	Toowoomba	Fed off (sheep)
F. T. Keable ..	Duke of York	115·5	34·0	75	May ..	After ..	January, also skim ploughed twice	S.C. four times	..	Warwick ..	..
Mrs. E. Sullivan ..	Clarendon ..	115·0	39·0	46	3 May ..	After ..	..	S.C. once S.T. twice	Once ..	Toowoomba	Fed off (sheep)
W. J. Lloyd ..	Pusa ..	114·5	38·0	52	9-12 June..	After ..	..	S.C. twice ..	Twice ..	Toowoomba	..
R. C. Holthouse ..	Clarendon ..	114·5	40·0	50	Mid June ..	After ..	..	S.C. once S.T. once	Twice ..	Toowoomba	..
W. H. Groves ..	Florence ..	114·0	36·0	60	End of May	After ..	February	S.C. twice ..	Thrice ..	Warwick ..	..
N. McCoist	Pusa ..	114·0	42·0	60	End of May	After ..	November and February	..	Thrice ..	Warwick ..	..

Rate of Seeding.

The average rate of seeding was 54 lb. per acre for both the Toowoomba and the Warwick districts. Sowing with the "combine" drill was fairly general.

Feeding Off.

Twenty-five per cent. of the growers fed their crops off with sheep.

Number of Years Land Sown to Wheat.

The major number of fields entered in the competition had been cropped for a period ranging from one up to six years. In one instance the land had been cropped with wheat for thirty years, and the yield was 40 bushels per acre. *This crop was not fertilised.*

Fertiliser Used.

Eleven growers in the Warwick district applied super, the average quantity being 50 lb. per acre.

The average apparent yield of the competition crops in this locality was 34 bushels per acre. Similarly, for the eleven fertilised crops, 34⅝ bushels.

GENERAL OBSERVATIONS.

The Season.—The rainfall was fairly evenly distributed over the six months' growing period of the crop—May to October—but, unfortunately, the winter was so mild that there was not sufficient seasonal frost or cold weather to keep rank growth in check. Apparently, all available sheep were used to try and keep some of the crops back, but operations were more or less hampered by the soft and sticky condition of the soil, induced by rain. Very heavy stocking was consequently resorted to on the black soil country. Even then a number of forward crops, in which the embryo ear had formed low down in the stem, had to be fed right back, necessitating their coming again from the stool. Rust was virulent in the late maturing crops.

Frost.—As the wheat was coming into head and when out in flower a few severe frosts damaged a number of varieties; the latter may have been susceptible ordinarily, or happened to be growing on exposed country, or were not sufficiently resistant at the time owing to the plants being in a soft, succulent condition. Second growth was manifest in frosted crops, with the result that there was a proportion of immature grain in the harvested sample.

Varieties found to be more readily susceptible than others were Pusa, Florence, and Three Seas.

Several other varieties were found to be more or less affected in given localities, but in the generality of cases the wheat was in a susceptible condition at the time owing to having made forced growth.

Rust.—Into this favourable field came the rust. Its incidence and rapid development was the primary reason for the late withdrawal of a number of exceptionally promising crops from the competition. It also was responsible, particularly in susceptible and late maturing varieties, for a reduction in the number of points under the headings of disease, apparent yield, and for condition of crop.

Quick maturing, and therefore naturally rust escaping, varieties and those which were either moderately resistant or resistant to rust made the best showing throughout the competition.

A considerable increase took place in 1930 in the area cropped with wheat, which aggregated 325,000 acres, with an estimated yield of 4,750,000 bushels.

Although "rusty" years like the one under review are luckily few and generally far between, the probability is that the popularity of certain varieties will wane. Several found to be more or less affected by rust, both in and outside of the competition, were: Currawa, Cleveland, Nabawa, Waratah, Canberra, Duke of York, Watchman, Waterman, Warrior, Amby, and Roma Red.

Varieties slightly susceptible, but which generally gave a good account of themselves where conditions were reasonably favourable, are: Clarendon, Florence, Flora, Warren, Gluyas Early, Warchief, Cedric, Pusa, Novo, and Bunge.

Three Seas appeared to be a highly rust-resistant variety.

Bunt (Ball Smut).—With a few exceptions the seed wheat used in the competition crops was treated before sowing, either with bluestone, copper carbonate, or anti-bunt. General observation of the season's wheat crops, however, showed that many growers either omitted to take the necessary precaution to use uncontaminated seed or else failed to "pickle" it.

Flying Smut.—Unfortunately, this disease was found to be on the increase. Some varieties appear to be more susceptible than others, the commonly affected ones being: Currawa, Warren, Warchief, Canberra, Waratah, and Nabawa. Many growers with whom this question was discussed expressed the view that as flying smut did not show up in the harvested sample it was not so objectionable as bunt. It is patent,

however, that its presence accounts for a reduction in yield, and the disease, as stated, is on the increase.

As infection takes place the previous season, when the wheat is in the flowering stage and the mycelium of the fungus is retained inside the grain, ordinary fungicides and copper carbonate are of no value. The standardised hot water treatment, however, is effective both for "flying smut" and "bunt." Growers obviously have the means at hand of working up supplies of "clean" seed.

Other Wheat Diseases.

Flag Smut.—Flag smut, which threatened to do a good deal of harm in 1928, was evidently largely checked by the measures taken to control it. It was less in evidence in 1929, and in 1930 its presence was not noted in any crop.

As the disease is of an insidious nature, it may reappear in wheat crops under conditions favourable to its development.

"Foot Rot" or "Take All."—This disease was in evidence in a few of the competition crops, which lost points accordingly. Its incidence in Queensland wheat fields is comparatively recent. The disease is caused by a fungus which attacks the roots of the wheat plant. "Take all" usually appears in round patches in the crop, and if not checked will seriously reduce subsequent wheat yields, even up to 50 per cent.

Affected plants which happen to live until they reach the heading stage become sickly and bleach (whiteheads), and do not fill their grain.

Burning the stubble is advisable, but this does not account for the spores in the soil out of reach of the fire. Grain from affected crops should not be used for seed. Rotation crops must be grown, preferably maize or others not likely to form a host plant for the fungus, which also thrives on barley grass and one of the brome grasses, to which latter family Prairie grass belongs.

Pure Seed.

One of the inducements to enter for the competition was that grain from competing crops and from additional areas on the farm of the same variety was entitled to the Wheat Board's bonus of 2d. per bushel, provided it was true to type, free from disease and foreign grain and other seeds, and was in good, sound condition and fit for seed at the time of delivery.

Inspection was made during judging operations, and certificates were issued for approximately 30,000 bushels of wheat of different varieties. It is understood that all this grain is to be cleaned and graded and used for seed purposes.

It may be remarked in regard to the competing crops that some were very true to type; others were reasonably true from a commercial standpoint. The major number, however, left much to be desired on the score of purity.

The extra care and attention required in keeping the varieties grown on one farm quite distinct is fully realised, but where the production of pure seed is encouraged by a bonus this in itself should be a set off against the extra care required. There is much to be said in favour of growers selecting seed in the field and working up their own supplies, keeping them pure, and sowing only clean, graded seed.

The 1930 Wheat Crops.

Last season the increase in the area under wheat was most marked, indicating the possibilities of rapid expansion of the industry by the well-directed use, at any time, of modern machinery, providing economic conditions are favourable.

Observation of the wheat crops, and more particularly those on old cultivation paddocks, showed unmistakably that methods in vogue of continuously cropping with wheat require to be very carefully reviewed. Black oats are undoubtedly a serious menace. The presence of barley in wheat crops is another disability. Variegated thistles, wild turnips, and other aggressive weeds have made and will continue to make exceptional headway in cultivation paddocks unless promptly checked. Hexham Scent is very much on the increase. "Dockage" under these headings accounts for a considerable reduction in returns to individual growers.

Matters of this sort cannot very well be disregarded; actually they are vital to the wellbeing of the industry. A quick panacea for all the ills is not readily forthcoming. The individual grower is undoubtedly in the best position to cope with the major difficulties. Touching the question of black oats, barley, and weeds, shallow cultivation immediately after the removal of the wheat crop is advisable, as germination will be encouraged and the land is automatically brought into good shape to trap the rainfall, much of which latter would otherwise find its way into the nearest creek.

Suitable crop rotations, cleanly-kept cultivation, fallowing, and feeding-off with sheep all play their part in the control of weeds in the wheat fields. The latter are calling aloud for a cleanliness of cultivation which, particularly on old settled localities, is unfortunately all too frequently absent.

WHEAT CROP COMPETITION, 1930.

WARWICK DISTRICT.

Name and Address.	Variety.	Apparent Yield (Bushels).	Trueness to Type and Purity. (20 Points).	Freedom from Disease. (30 Points.)	Evenness of Crop. (20 Points.)	Condition. (10 Points).	Cleanliness. (20 Points.)	Total Points.
*R. S. Young, Freestone	Three Seas	45	18·0	28·0	18·5	8·5	16·0	123·5
†Ed. Kyle, Ellangowan	Pusa	44	16·0	26·5	17·0	8·0	17·5	119·0
‡F. Armstrong, Pilton	Pusa	42	15·5	26·0	16·5	8·0	17·5	116·5
F. T. Keable, Tannymorel	Duke of York	34	18·0	25·0	18·5	7·5	17·5	115·5
W. H. Groves, Freestone	Florence	36	15·0	26·0	17·5	8·0	17·5	114·0
N. McCoist, Wiyarra	Pusa	42	10·0	26·0	18·0	9·0	18·0	114·0
P. J. McGahan, Mount Sturt	Duke of York	32	18·0	23·5	18·5	7·0	19·0	114·0
Verney and Parkinson, Hermitage	Duke of York	36	18·0	24·0	17·5	7·0	16·5	113·0
W. P. Canning, Yangan	Pusa	34	15·5	27·0	17·5	7·5	16·5	113·0
H. Eastwell, Wheatvale	Clarendon	42	14·0	27·0	16·0	7·5	15·5	113·0
W. McVeigh, Swan Creek	Florence	38	12·0	26·0	18·0	7·5	18·0	112·5
J. A. Buckley, Rosehill	Novo	37	15·5	25·0	17·5	7·0	16·5	112·0
Braithwaite Bros., Junabee	Clarendon	34	14·5	26·5	17·0	7·5	17·5	112·0
W. M. Wagland, Clifton	Florence	42	8·0	28·0	17·5	8·0	17·5	112·0
W. P. Cooper, Massie	Duke of York	27	19·0	24·0	18·0	7·0	18·0	111·5
P. O'Mara, Tannymorel	Clarendon	39	12·0	26·5	16·5	7·5	17·0	111·0
W. G. Skerman, Willowvale	Clarendon	37	15·5	25·0	16·5	7·0	16·5	111·0
W. J. Ryan, Allora	Flora	34	17·5	26·0	14·5	6·0	18·0	111·0
Carey Bros., Canning Downs	Clarendon	38	14·0	24·0	16·5	7·5	17·5	110·5
T. A. Brownlee, Junabee	Duke of York	31	17·0	23·5	18·5	7·0	17·0	110·5
Morgan Bros., Tannymorel	Pusa	39	15·0	24·0	17·0	7·5	15·0	110·0
R. S. Young, Freestone	Clarendon	38	16·0	26·0	14·0	7·0	16·0	110·0
D. Braithwaite, Tannymorel	Clarendon	40	16·0	18·0	17·0	8·5	17·5	109·0
J. W. Watt, Mill Hill	Florence	39	14·5	23·0	17·5	6·5	16·0	109 0
W. P. Canning, Yangan	Novo	32	14·5	26·0	17·0	6·0	17·0	108·5
R. Hamilton, Wildash	Waratah	36	14·5	23·0	17·5	6·0	17·5	108·5
J. J. Booth, Junabee	Clarendon	36	10·0	26·0	17·0	7·5	17·5	108·0
H. W. Vine, Junabee	Waratah	33	16·0	24·0	16·5	7·0	16·0	108·0
M. McMahon, Freestone	Florence	40	12·5	26·0	16·0	7·5	14·0	108·0
J. McMahon, Sladevale	Pusa	33	12·0	25·0	17·5	7·5	17·0	107·5
Verney and Parkinson, Hermitage	Pusa	38	12·0	25·0	16·0	7·0	16·0	107·0
R. and F. W. Moar, Pilton	Pusa	42	15·0	22·0	15·0	6·0	16·0	107·0

* First in District Competition and Second in Grand Championship. † Second in District Competition. ‡ Third in District Competition.

WHEAT CROP COMPETITION, 1930—*continued.*

WARWICK DISTRICT—*continued.*

Name and Address.	Variety.	Apparent Yield (Bushels).	Trueness to Type and Purity. (20 Points).	Freedom from Disease. (30 Points.)	Evenness of Crop. (20 Points.)	Condition. (10 Points).	Cleanliness. (20 Points.)	Total Points.
J. J. Hartnett, Freestone	Florence	28	15·5	23·0	17·0	7·0	17·5	106·0
F. R. Morrice, Hermitage	Duke of York	28	16·0	23·0	18·0	7·0	15·0	105·0
W. Evans, Pilton	Pusa	36	14·0	24·0	15·0	6·5	15·0	104·5
G. A. Gross, Sladevale	Pusa	33	10·0	24·0	17·5	7·5	16·0	103·5
Geo. Gross, Sladevale	Pusa	34	10·0	24·0	17·0	7·5	16·0	103·5
B. C. Madsen, Freestone	Florence	36	10·0	23·5	17·0	7·0	16·0	103·5
R. J. Brownlie, Junabee	Duke of York	30	16·5	22·0	15·5	6·0	16·0	103·0
A. J. Kemp, Junabee	Pusa	32	10·0	24·0	16·5	7·5	16·0	102·0
R. Hamilton, Wildash	Pusa	33	12·0	20·0	17·0	6·5	17·5	101·5
F. T. Keable, Tannymorel	Pusa	36	12·0	24·0	17·0	7·5	10·0	100·5
D. McDonnell, Massie	Gluyas	32	9·0	25·0	15·0	7·0	16·0	100·0
N. C. Neilsen, Sladevale	Clarendon	33	12·0	20·0	16·0	6·0	17·5	100·0
R. J. Box, Murray's Bridge	Pusa	39	14·0	18·0	15·0	6·5	14·5	99·5
S. L. Saal, Pilton	Cedric	36	16·0	20·0	13·0	5·0	15·5	99·5
Morgan Bros., Tannymorel	Waratah	36	12·0	20·0	16·5	6·0	14·5	99·0
A. Madsen, Loch Lomond	Pusa	27	10·0	23·0	16·0	7·0	17·5	99·0
J. R. McConville, Swan Creek	Florence	36	8·0	20·0	17·0	7·0	17·0	99·0
J. Woodford, Wheatvale	Clarendon	33	12·0	23·5	14·0	7·0	14·0	99·0
E. M. and N. E. Mills, Clifton	Warren	36	15·0	22·0	12·0	5·0	15·0	99·0
E. M. and N. E. Mills, Clifton	Pusa	36	8·0	23·0	16·0	7·0	14·0	98·0
D. Conway, Swan Creek	Clarendon	27	13·0	22·0	16·0	6·0	15·0	97·5
J. C. McIntosh, Jew's Retreat	Florence	28	10·0	27·0	12·0	8·0	14·0	97·0
C. Gustafson, Tannymorel	Clarendon	40	8·0	15·0	17·0	7·5	17·0	96·5
D. McDonnell, Massie	Florence	33	9·0	20·0	15·0	6·5	16·0	95·0
G. L. Wilson, Mount Sturt	Clarendon	30	9·0	22·0	17·0	5·0	15·0	95·0
W. Lysaght, Clinton Vale	Novo	24	12·0	18·0	17·5	6·0	17·5	95·0
J. J. O'Brien, Massie	Cleveland	21	17·5	15·0	18·0	5·0	17·0	93·5
E. Neilsen and W. H. Mogridge, Wiyarra	Waratah	28	12·0	19·0	15·5	6·0	14·5	93·0
H. Carey, Loch Lomond	Pusa	30	8·0	23·0	14·0	6·0	14·0	92·0
W. Erlandson, Allora	Nabawa	21	15·0	15·0	17·0	5·0	17·0	90·0
W. Lysaght, Clinton Vale	Flora	21	10·0	12·0	17·5	5·0	17·5	83·0
J. Woodford, Wheatvale	Cleveland	18	12·0	10·0	14·0	4·0	12·0	70·0

WHEAT CROP COMPETITION, 1930—*continued.*

TOOWOOMBA DISTRICT.

Name and Address.	Variety.	Apparent Yield (Bushels).	Trueness to Type and Purity. (20 Points).	Freedom from Disease. (30 Points.)	Evenness of Crop. (20 Points.)	Condition. (10 Points).	Cleanliness. (20 Points.)	Total Points.
*Mrs. K. McGlynn, Pampas	Clarendon	46	18·5	28·5	18·0	8·5	19·0	127·5
†C. Town, Kaimkillenbum	Novo	42	16·0	26·0	17·5	7·5	17·5	117·5
‡J. and J. Lemon, Cambooya	Duke of York	34	19·0	25·0	18·5	7·5	17·0	116·0
Mrs. E. Sullivan, Pittsworth	Clarendon	39	16·5	27·0	16·5	7·5	16·0	115·0
W. J. Lloyd, Harrow, Cambooya	Pusa	38	15·5	26·0	17·0	8·0	17·0	114·5
R. C. Holthouse, Westbrook	Clarendon	40	17·0	26·0	17·0	7·5	15·0	114·5
H. E. Luck, Cambooya	Florence	38	16·0	27·0	17·0	7·0	15·5	113·5
J. T. Luff, Kaimkillenbum	Florence	34	16·0	27·0	16·5	8·0	17·0	113·5
Mrs. K. McGlynn, Pampas	Pusa	40	14·0	25·0	17·0	7·0	17·5	112·5
F. W. Muggridge, Kaimkillenbun	Duke of York	30	18·0	26·0	17·0	7·0	17·0	112·0
A. L. Bridgeman, Southbrook	Clarendon	39	14·0	26·0	17·0	8·0	15·0	111·5
Colin McCallum, Pittsworth	Warchief	36	16·5	23·0	17·0	8·0	17·0	111·5
F. Bach, Oakey	Currawa	38	16·0	22·0	17·5	7·5	17·5	111·5
J. and J. Lemon, Cambooya	Florence	30	17·5	26·0	17·0	7·5	16·0	111·0
J. G. K. Bell, Oakey	Cedric	30	17·0	26·0	15·0	8·0	18·0	111·0
R. M. and J. H. Anderson, Southbrook	Clarendon	39	15·0	25·0	15·5	7·5	16·5	111·0
M. Stower, Linthorpe, *via* Pittsworth	Florence	36	14·5	25·0	16·5	7·5	17·0	110·5
H. C. M. Sharpe, Lavelle, *via* Milmerran	Pusa	32	16·5	24·0	17·0	7·0	17·0	109·5
H. S. Handley, Pampas	Cedric	36	16·0	24·0	16·0	7·0	16·5	109·5
H. S. Handley, Pampas	Florence	36	15·5	24·5	16·0	7·0	16·0	109·0
W. and G. Hogarth, Clifton	Florence	36	12·5	25·0	16·5	7·5	17·0	108·5
W. H. Taylor, Westbrook	Pusa	28	14·0	27·0	16·5	7·5	17·0	108·0
Ziesemer Bros., Bongeen	Gluyas	28	16·0	24·0	18·0	7·0	16·5	107·5
Colin McCallum, Pittsworth	Florence	34	10·0	26·0	17·0	6·0	16·0	104·0
F. M. Bradhurst, Baking Board	Clarendon	30	15·0	24·0	15·5	6·5	16·0	104·0
G. J. Will, Kincora, Pittsworth	Gluyas	27	18·5	18·0	17·0	5·0	19·0	103·0
M. Stower, Linthorpe, *via* Pittsworth	Warren	36	12·0	18·0	17·0	7·0	17·5	101·5
L. G. Morwood, Yalanga	Pusa	33	10·0	26·0	14·5	7·0	12·0	98·0
Mrs. L. E. Anderson, Southbrook	Warchief	33	17·0	12·0	16·0	6·5	16·0	96·0
A. L. Bridgeman, Southbrook	Duke of York	26	13·5	20·0	17·0	5·0	15·0	95·5
G. J. Will, Kincora, Pittsworth	Duke of York	20	19·0	15·0	18·0	4·0	19·0	95·5
J. W. Joppich, North Branch, Pittsworth	Cleveland	22	17·5	15·0	18·0	5·0	17·5	95·0
L. G. Morwood, Yalangar	Duke of York	22	17·5	18·0	17·0	5·0	15·0	94·5
R. C. Holthouse, Westbrook	Nabawa	22	15·0	15·0	15·0	4·0	15·0	86·0
Mrs. E. Gibbs, Brookstead	Currawa	22	10·0	12·0	12·0	4·0	9·0	69·0

* First in District Competition and Grand Championship. † Second in District Competition. ‡ Third in District Competition.

THE NEXT COMPETITION.

With a view to improving certain features in connection with wheat crop competitions, the Department of Agriculture and Stock submitted certain proposals to the Wheat Board. These were approved. The manager of the Wheat Board is seeking the co-operation of the several Agricultural Societies concerned.

Proposed Conditions.

(*a*) Crops are to be grown on "summer fallowed" land. Cultivation for same may commence on 1st to 30th October to follow the removal of any kind of crop, not necessarily wheat.

Judging of fallow to commence about the 1st May, 1931, under the following headings:—

Moisture	35 points.
Mulch	35 points.
Cleanliness	35 points.
Compactness	35 points.
Headlands and finishes	10 points.
Total	150 points.

Soil cores to be taken at depths of 6 in. and 18 in. for moisture content.

(*b*) The wheat crop competition to be carried out under similar conditions to that of last year. Crops to be judged immediately prior to ripening.

(*c*) Grain from competition crops approved for seed purposes and from larger fields of the same variety on the farm will be entitled to a bonus of 2d. per bushel from the Wheat Board on delivery in good, sound condition, fit for seed.

Entry fee, £1. Nomination, 5s., payable by 30th March, 1931. Balance of fee payable by 15th September, 1931.

ACKNOWLEDGMENT.

The judges desire to tender thanks to the manager and members of the State Wheat Board and the respective secretaries of the Royal National Association, Brisbane, the Royal Agricultural Society, Toowoomba, and the Eastern Downs Horticultural and Agricultural Association, Warwick, for their valued assistance in all matters connected with the competition.

QUEENSLAND SHOW DATES, 1931.

Stanthorpe: 4th to 6th February.
Allora: 18th and 19th February.
Killarney: 27th and 28th February.
Millmerran: 3rd March.
Pittsworth: 5th March.
Warwick: 10th to 13th March.
Toowoomba: 23rd to 26th March.
Oakey: 11th April.
Goondiwindi: 10th and 11th April.
Dalby: 15th and 16th April.
Chinchilla: 21st and 22nd April.
Miles: 29th April.
Taroom: 4th to 6th May.
Murgon: 7th to 9th May.
Boonah: 6th and 7th May.
Ipswich: 12th to 15th May.
Mitchell: 13th and 14th May.
Kilkivan: 20th and 21st May.
Biggenden: 21st and 22nd May.
Kalbar: 23rd May.
Wowan: 4th and 5th June.
Lowood: 19th and 20th June.
Mount Larcom: 19th and 20th June.
Rockhampton: 23rd to 27th June.
Kilcoy: 2nd and 3rd July.
Home Hill: 3rd and 4th July.
Townsville: 7th to 9th July.
Gatton: 8th and 9th July.
Cleveland: 10th and 11th July.
Caboolture: 16th and 17th July.
Rosewood: 17th and 18th July.
Ithaca: 18th July.
Esk: 24th and 25th July.
Maleny: 29th and 30th July.
Royal National: 10th to 15th August.
Wynnum: 28th and 29th August.
Imbil: 2nd and 3rd September.
Beenleigh: 18th and 19th September.
Rocklea: 26th September.

PUREBRED DAIRY CATTLE.

RECORDS OF PRODUCTION.

By CHAS. McGRATH, Supervisor of Dairying.

A FUNDAMENTAL consideration relative to the breeding of purebred cattle is increased attention to production recording.

Studmasters in the vanguard of dairy cattle breeding realise that registration alone is not a guarantee of progress, but in establishing blood lines based on profitable production, and by systematic recording, are developing families, or blood lines which are pure in high production traits.

The importance of production recording of dairy females is difficult to overestimate, and an extension of this work will ensure the gradual development and improvement of the individual animals constituting the purebred dairy herds of the State.

Production Records Essential.

The production records are essential as a basis for selection of animals possessing true dairy traits. In the main, high producers inherit such characteristics from their ancestors; and, while a perusal of the records of each animal is highly instructive, one should not overlook the importance of studying the blood lines of the qualifying females and realise the increase in production due to the influence of the prepotent sire.

Test recording in our purebred herds has been instrumental in bringing prominently before breeders and all interested in the industry the true value of purebred sires proved to be capable of increasing production in their offspring; and the demand for purebred sires possessing such characteristics has increased, as breeders are willing to pay good prices for sires bred on high production lines.

Production recording has created such a demand, but an extension of the activities of testing purebred females is essential to meet the demand, as the increased production of the dairy cow is the all-important problem of the dairy industry and the chief factor in the economical production of dairy products and efficiency in the dairying industry.

As the breeders of stud dairy stock give prominence to the testing of the females constituting their herds, the general dairy farmers will be induced to weigh and test the milk of their cows, and it is then that they will appraise the value of the blood that the stud breeder offers through the sale of his young stud sires, and will appreciate the work of our studmasters.

Production recording will convince the most sceptical of the definite value of blood lines and point conclusively to the fact that certain families are decidedly more productive than others, and in a striking way show the great difference that exists between individuals in the same breed.

Production recording is the source from which information pertaining to the type and productivity of the families of cows that laid the foundation of the high-class herds of the various dairy breeds is obtained.

What a fund of knowledge is available from a study of the production records! The lesson learnt places one in a position to overcome many of the difficulties that confront the stud breeder and dairy farmer in their quest to acquire a herd comprised of animals of productive merit and prepotency capacity.

Choosing a sire without regard to blood or family lines, or careless or haphazard selection of a dairy sire, increases the element of chance, and frequently defeats the stud breeder and dairy farmer from attaining their objective—increased production, increased profits, and a fixed type of dairy animal.

Outcrossing generally tends to increase the amount of variation in the progeny, as the sire and dam may have a large number of variations which will exercise an important influence on the power to transmit characteristic traits, such as production, type, colour, and temperament, to their offspring.

PRODUCTION RECORDING.

Cows officially tested by Dairy Inspectors attached to the Department of Agriculture and Stock, for entry into the Herd Book of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society of Queensland. The final tests of the undermentioned cows were carried out during the months of September and October, 1930. (273 days periods unless otherwise stated).

AUSTRALIAN ILLAWARRA SHORTHORN.

Name of Cow.	Age.	Milk Production.	Butter Fat.	Sire.	Dam.	Owner.
		Lb.	Lb.			
Diana 17th of Kelston (365 days)	Junior (2 year)	17,430·2	721·255	First Warrior of The Cedars	Diana 7th of Jinbiggaree	A. Frank, Boonah
Fuchsia 11th of Fairlie	Junior (2 year)	6,095·5	216·326	Dividend of Rosenthal	Fuchsia 5th of Fairlie	C. B. Mitchell, Warwick
Amy 5th of Fairholme	Junior (2 year)	6,006·6	249·962	Regent of Greyleigh	Amy 3rd of Fairholme	Agricultural High School and College.
Wunulla Lustre 3rd	Senior (3 years)	9,350·879	377·69	Robin Hood of Greyleigh	Lustre 2nd of Wunulla	J. Bradley, Goomeri
Mayflower of Lawndale	Junior (3 years)	10,707·375	404·09	President of Oakvale	Mayflower of Lawndale	M. J. Brosnan, Clifton
Empress of Homelea	Junior (2 years)	9,414·5	366·072	Emperor of White Park	Damse of Homelea	Jas. Savage, Humphrey
Heather of Trevor Hill	Senior (2 years)	9,062·3	407·924	Prince of Praemer	Star of Trevor Hill	G. Gwynne, Umbiram
May 3rd of Beechwood	Junior (3 years)	7,625·75	333·32	Royal Lad of Blacklands	May of Beechwood	F. W. Woolley, Moregatta
Miss Mystery of Broadwater	Junior (2 years)	6,117·1	250·106	Fussy's Charmer of Fairfield	Mystery 2nd of Woodleigh	Pledger and Dodd, *via* Nanango
Choice 4th of Rosenthal	Senior (3 years)	7,942·5	309·646	Sunshine of Rosenthal	Choice 3rd of Strathdu	S. Mitchell, Warwick
Jubilee 4th of Rosenthal	Junior (3 years)	6,987·75	271·291	Sunshine of Rosenthal	Jubilee 3rd of Rosenthal	S. Mitchell, Warwick
Flossie of Lynfield	Junior (2 years)	4,598·3	189·756	Royal Monarch of Blacklands	Queenie 2nd of Lynfield	F. E. Birt, Sexton
Plum of Glenleigh	Mature	10,054·75	435·751	Alpha	Cherry of Glenleigh	C. O'Sullivan, Greenmount
Dandy II. of Brundah	Mature	10,820·55	364·409	Cupid of Greyleigh	Dandy of Brundah	B. C. Tuckett, Brookfield
Sweetheart 3rd of Illawah	Senior (3 years)	12,144·5	446·324	Veteran of Greyleigh	Sweetheart of Illawah	B. C. Tuckett, Brookfield
Mavis of Mt. Blow	Senior (2 years)	5,150·165	188·548	Brilliant of Greyleigh	Model 14th of Greyleigh	Mrs. J. Handley, Murphy's Creek
Cherry 3rd of Mt. Blow	Senior (2 years)	5,563·505	187·639	Brilliant of Greyleigh	Cherry 2nd of Mt. Blow	Mrs. J. Handley, Murphy's Creek
Favourite 8th of Fairlie	Mature	7,506·25	300·785	Charmer of Strathdu	Favourite of Fairlie	C. B. Mitchell, Warwick
Killarney 2nd of Fairlie	Mature	10,013·5	391·859	Kitchener of Rosenthal	Killarney of Fairliee	C. B. Mitchell, Warwick
Daisy of Wolvi	Junior (2 years)	8,365·9	282·749	Lucky Premier of Blacklands	Daisy of the Valley	V. Dunstan, Gympie
Model 2nd of Eden Vale	Mature	9,047·45	370,005	Karl of Ashborne	Model	H. Kinnear, Millaa Millaa
Maggie 2nd of Homelea	Junior (4 years)	8,833·25	318·585	Reflection of Springdale	Maggie of Homelea	G. D. Lindenmayer, Mundubbera
Trixy 6th of Strathdu	Mature	8,420·75	316·839	Admiration 2nd of Devon Park	Trixy 2nd of Strathdu	S. Mitchell, Rosenthal
Favourite 13th of Fairlie	Junior (2 years)	6,254	255·788	Dividend of Rosenthal	Favourite of Fairlie	C. B. Mitchell, Fairlie, *via* Warwick
Chance 5th of Fairlie	Junior (2 years)	7,271	270·064	Dividend of Rosenthal	Chance of Fairlie	C. B. Mitchell, Fairlie, *via* Warwick
Queenie of Huntleigh	Mature	9,292·5	343·326	Defender of Springdale	Queenie 3rd of Springdale	J. C. Savage, Humphrey
Venus of Euroa	Mature	11,761·75	467·045	Annie's Favourite Boy	Venus of Hillcrest	H. F. Lindenmayer, Mundubbera

PRODUCTION RECORDING—*continued.*

JERSEY.

Name of Cow.	Age.	Milk Production.	Butter Fat.	Sire.	Dam.	Owner.
		Lb.	Lb.			
Trecarne Magnet 2nd	Junior (3 years)	3,635·304	219·441	Carnation Royal Scot	Flora 24th	T. A. Petherick, Lockyer
Glengariffe Noble Diva	Mature	6,453·3	385·914	Retford Mendel's Noble	Madeira's Dahlia of Taraganda	R. V. Cox, Maleny
Glengariffe Noble Gaza	Mature	5,889·35	370·071	Retford Mendel's Noble	Willah's Gazette of Kameruka	R. V. Cox, Maleny
Foxglove of Southport	Junior (2 years)	7,282·597	377·589	Werribee Twylish Starbright King	Greta of Southport	J. Collins, Tingoora
Dainty of Calton	Junior (2 years)	5,720·407	298·070	Retford Meteor	Nellie of Millstream	J. Collins, Tingoora
Duchess of Calton (365 days)	Mature	17,090·081	771·281	Clair Val Hero	Trinity Montrose	J. Collins, Tingoora
Choices Silver Spray of Burnleigh	Mature	5,160·25	295·299	Trinity Baron	Britannia's Choice of Burnleigh	W. W. Mallett, Nambour
Trinity Olivia	Junior (3 years)	5,168	257·806	Lord Ettrey of Banyule	Brunette	J. N. Kidd, Kunioon
Easter's Elsie of Morago	Junior (2 years)	4,692·242	244·39	Molly's Goldfinder of Bellevue	Easter Day of Morago	P. C. Henman, Mudgeeraba
Golden Gilt of Woodstock	Mature	8,581·77	410·7	Golden Jolly	Bright Gilt 2nd of Woodstock	P. C. Henman, Mudgeeraba
Tot of Burnleigh	Junior (2 years)	6,489·75	347·206	Noisy Jim of Burnleigh	Trixie of Burnleigh	Chas. Klaus, Mundubbera
Oxford Bright Eyes	Senior (3 years)	7,867·375	428·762	Oxford Brighton King	Jersey Maid 5th	E. Burton and Sons, Wanora
Glenview Oxfordia	Senior (3 years)	5,221·35	265·894	Carlyle Larkspur 2nd's Empire	Oxford Buttercup 5th	F. P. Fowler and Son, Coalstoun Lakes
Trecarne Madeira 3rd	Junior (3 years)	4,669·985	282·733	Carnation Royal Scot	Trecarne Madeira	T. A. Petherick, Lockyer
Trecarne Flora 2nd	Senior (3 years)	4,992·025	293·552	Carnation Royal Scot	Flora 24th	T. A. Petherick, Lockyer
Majesty's Kate of Brooklands	Junior (2 years)	4,344·95	218·434	His Majesty of Dalebank	Sultan's Tibby of Brooklands	W. S. Conochie, Sherwood
Jessica of Brooklands	Mature	4,317·2	205·715	Golden Ferns Idyl	Jess	W. S. Conochie, Sherwood
Lily's Maid of Southport	Junior (2 years)	6,795·5	279·548	Werribee Twylish Starbright King	The Maid of Southport	J. and R. Williams, Kingaroy
Kelvinside Amber	Junior (3 years)	9,570·95	468·704	Springmead Tarzan	Diamond of Cedar Grove	J. and R. Williams, Kingaroy
Kelvinside Alice Arabel	Senior (2 years)	6,887·35	363·575	Benedictine's Perfection of Kelvinside	Alice May of Kelvinside	J. and R. Williams, Kingaroy
Bluebell 2nd of Southport	Junior (2 years)	5,290·1	251·728	Werribee Twylish Starbright King	Blue Bell of Southport	J. and R. Williams, Kingaroy
Poppy of Southport	Mature	6,233·626	352·478	Trinity Alfriston Duke	Orange of Southport	J. and R. Williams, Kingaroy
Britannia of Rosehill (257 days)	Junior (2 years)	5,380·6	302·294	Raleigh's Lad of Rosehill	Queen of Rosehill	T. Gillespie, Ravenshoe
Memony of Rosehill	Junior (2 years)	5,287·15	296·812	Retford Raleigh's Chief	Charm of Rosehil	T. Gillespie, Ravenshoe
Trinity Dahlia (264 days)	Mature	4,994·75	265·872	Ginger Duke	Trinity Maid	T. Gillespie, Ravenshoe
Glenview Alfriston Duchess	Junior (2 years)	4,444·8	269·98	Trinity Alfriston	Oxford Buttercup	F. P. Fowler and Son, Coalstoun Lakes
Trinity Skylight	Senior (3 years)	4,341·95	249·846	Lord Ettrey of Banyule	Starlight	F. P. Fowler, and Son Coalstoun Lakes
Choice's Mascot of Burnleigh	Mature	4,962·65	313·825	Trinity Baron	Britannia Choice of Burnleigh	W. W. Mallett, Nambour
Jewel of Burnleigh (365 days)	Junior (2 years)	7,530·55	435·862	Trinity Darby	Chains Gem of Burnleigh	W. W. Mallett, Nambour
Bellefaire Claire De Lune	Junior (2 years)	6,312	302·736	Masterpiece Yeribee of Bruce Vale	Madeira 3rd	D. R. Hutton, Cunningham
Princess 2nd of Ferndale (365 days)	Junior (4 years)	11,726·25	536·515	Janet's Palatine of Rosedale	Princess Galatea of Woodlands	D. R. Hutton, Cunningham
Songbird of Burnleigh	Junior (2 years)	4,496·25	249·985	Trinity Darby	Carlyle Wrentham Princess	Chas. Klaus, Mundubbera
Miss Chain of Golden Hill	Junior (2 years)	4,056·5	261·222	Trinity Triumph	The Endless Chain	Chas. Klaus, Mundubbera
Inasfayl Bessie	Senior (4 years)	5,737·2	327·864	Norwood Model	Inasfayl Betsy	McGeehan Bros., Kairi

Line Breeding.

Line breeding has played an all-important part in the improvement of domestic live stock. Breeders of stud dairy stock whose work has resulted in the establishment of herds noted for productivity have given careful consideration to the selection of the females on a production basis, and by breeding them to sires from ancestry of high production restricted their breeding operations to well-defined blood or family lines, excluding everything outside the approved and chosen lines of breeding.

Methodical line breeding combines animals similar in characteristics, and confines the blood lines to a few families of related lines of descent, purifies the pedigree, checks variability and increases prepotency.

Applied intelligently by studmasters, systematic line breeding during the past century has greatly increased the value of the domestic live stock. The results achieved are strikingly evident from the increased milk production of representatives of the several breeds of dairy cattle.

The increased production recorded in individual animals in all dairy breeds in recent years and the present activities of breeders are an indication of greater progress that is to follow.

A successful breeder of dairy stock will be one who has assessed the value of his herd by systematic recording—the only sound system of determining values.

A perusal of the results of official production recording for entry into the advanced register of the different breeds of dairy cattle will disclose the names of breeders pursuing the quest for the best dairy cow.

GRASS SEED IN EYES OF SHEEP—TREATMENT.

Because of the heavy growth of grass this season trouble is occurring as a result of the seed getting into the eyes of sheep. This especially is the case where barley grass (sometimes called fox-tail) and corkscrew grass have seeded very freely. The seed quickly causes inflammation, and if attention is not given to the animal total blindness will often occur.

Wherever practicable the sheep should be kept out of the long grass at this time. In cases where the seed has already caused trouble the foreign matter should be removed as quickly as possible from the eyes. This can usually be done with the fingers or a small pair of tweezers, but the eyelid should be carefully turned back to make sure that no seeds remain. Any excess of wool round the eye should also be clipped away.

The animals should then be treated with one or other of the following lotions, both of which have proved very effective:—

1.	Iodine	3 grains.
	Potassium Iodide	6 grains.
	Water	2 ounces.
2.	Sulphate of Zinc	1 part.
	Water	40 parts.

Equal to one dessertspoonful of zinc sulphate in half pint water.

The sheep should be held with the head on one side and the eye directed upwards. Several drops of the lotion are then instilled into the eye by means of an eye-dropper or piece of cloth saturated in the lotion. In doing this the eyelids should be drawn away from eyeball and care taken to see that the lotion flows under the lids and reaches all parts of the eye. When practicable this treatment should be repeated daily, when a rapid return to normal can be expected.

When severe cases have been drafted out these should receive more constant treatment. Gummed eyelids should be separated by bathing with warm water, and when the eyes have been cleaned the lotion should be applied twice daily. In the treatment of valuable or stud animals it is advisable to augment the above treatment by the application of the following ointment:—

Yellow oxide of mercury ointment	1 part.
Vaseline	9 parts.

This ointment should be introduced under the upper or lower eyelid after the early soreness had disappeared. The treatment should be continued until recovery has taken place.

As previously indicated, if not treated promptly the sheep may become temporarily blinded, and in the animal's wanderings the trouble becomes intensified. The moisture which comes from the eyes as a result of the inflammation causes dampness on the cheeks, predisposing the sheep to blow-fly attack.—A. and P. Notes, N.S.W. Dept. Agric.

Answers to Correspondents.

Feather-eating Fowls.

"POULTRY" (Torbanlea)—The Poultry Expert, Mr. P. Rumball, advises as follows:—

Feather-eating is a vice usually contracted by birds accidentally obtaining a feather the quill of which contains blood. Fowls are very partial to blood, and they naturally look for more feathers, with the result that the vice soon spreads through the pens. This habit is noticed more frequently among stock confined than with those on range. To break the birds of this vice it is necessary to try to occupy their attention. Make them work for the grain portion of their ration by feeding it in litters. Feed frequently. Give liberal supplies of green feed, and keep them apart as much as possible. This can be done by giving them free range.

Cowpeas and Soy Beans as Pig Feed.

In answer to an inquiry as to the use of cowpeas and soybeans in the feeding of pigs, we have to advise that neither of these crops can be looked upon as among the best from a green food point of view, for in the case of cowpeas, pigs do not appreciate the vines of this plant to anything like the extent that they do in the case of field peas, and we have seen many instances in which pigs refuse to eat cowpea vines at all, except when they are cut down and allowed to wilt for a couple of days. The soybean plant is also rather fibrous, and is not altogether palatable; hence, in both cases, better results will be obtained from the grain. If it can be arranged, it would be preferable to grow both these crops in combination with maize. The book, "Potts on Pigs," has an extensive reference to these matters in the chapters dealing with feeding, commencing on page 82 and the particular references on pages 138 and 139. This book may be purchased at booksellers at 12s. 6d. or 13s. 6d., post free, and is well worth careful study.

If, say, cowpeas are grown in combination with maize, and both crops are fed off at the one time, the pigs would have a good balanced ration, provided some more succulent green food was available, plus water or milk.

Soy beans are not grown very much in this country as a pig food, and considerable care must be exercised in feeding them to pigs, particularly during the fattening stages, otherwise the resultant pork may be soft and oily, and therefore unsatisfactory to the bacon curer. Both crops give an appreciable yield of grain, and where judiciously handled in combination with nitrogenous and fat-forming foods, are well worth cultivation.

Cowpeas are grown extensively as green manure in the Northern portions of the State. Soy beans do particularly well on the Darling Downs, and if fed in combination with lucerne, provide a good ration.

Ailing Sow.

G.H.T. (Oakey)—

Apparently the sow has not been suckling her young as she should, either because she had an insufficient supply of milk, or has a number of blind teats. Possibly the sow suffered from milk fever after farrowing and lost most of her milk, or perhaps the suckers have bitten her teats and have irritated her to such an extent that she has refused to suckle them to anything like the extent she should. It may be, also, that the sow is too low in condition or has not been properly fed or managed, and it may be due to inferior breeding and the effects of in-breeding. Lack of vigour, a poor milk supply, and other abnormalities like this are often hereditary. There are cases, too, when pigs may have proper food, breeding, and feeding, but are housed under insanitary conditions and fed from troughs polluted with filth and the germs of many diseases. It would be preferable to add the iodine to the sow's food and not to the young pigs' food.

A complete change of diet, ample grazing over succulent pasture, a liberal supply of fresh water, and plenty of charcoal and bone meal will help, while sound grain crushed and soaked or boiled for very young pigs is essential. The use of concentrated foods and of stock tonics in cases where the stock are not doing well is also good practice. Watch the sow carefully to note that she is not suffering from constipation and give her a change of food, and we are sure good results will follow.

General Notes.

Grade Standards for Tomatoes.

The Governor in Council has approved of an amendment of the Regulations under *"The Fruit and Vegetables Act of* 1927" applying to grade standards for tomatoes. In future there will be two grades only for tomatoes instead of three as formerly. "B" and "C" grades have been rescinded and a new "B" grade substituted. The latter will provide for the marketing of sound fruit subject to skin blemishes as prescribed under the Regulations. The present Regulations exclude sunburnt tomatoes, but it was thought that slightly sunburnt fruit was just as suitable for marketing as other blemished fruit, and consequently provision is also made for such tomatoes by allowing fruit sunburnt to the extent of 2½ per cent. of its surface to be marketed.

Local Sugar Cane Prices Boards' Elections.

In connection with the forthcoming elections for representatives of canegrowers on Local Sugar Cane Prices Boards an Order in Council has been issued removing all members of such Boards throughout Queensland who were appointed by notices dated the 27th March, 10th April, 10th July, 24th July, and 11th September, 1930. These members were appointed for the 1930 crushing season only, and, as this season is now finished, these members have been removed in order that new members may be appointed for the 1931 season.

Candidates for election as representatives of Canegrowers on Local Sugar Cane Prices Boards must be nominated on or before the 31st January, 1931.

Atherton Tableland Maize Board.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, Brisbane, until 5 p.m. on the 18th February, 1931, for election as growers' representatives on the Atherton Tableland Maize Board.

Five such representatives are to be elected by growers who, subsequent to the 25th day of March, 1930, grew for grain within the petty sessions districts of Atherton, Herberton, or Chillagoe, at least 1 acre of maize, and delivered the product of same or part of same to the Board for sale.

Each nomination is to be signed by at least ten growers of maize as above.

Persons eligible to vote are invited to send their names and addresses at once to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Staff Changes and Appointments.

The following persons residing in the Innisfail-Tully districts have been appointed Honorary Rangers under the Animals and Birds Acts for the purpose of protecting bird life in those districts:—Messrs. M. McNamee, Japoon, via Innisfail; J. Turco, Silkwood; J. A. Winter, Nuramo; R. C. Jackson, El Arish; G. R. Blair, Tully; and J. J. Cran, Tully.

Mr. F. J. Harris, Assistant to Analyst, has been appointed Analyst, Agricultural Chemical Laboratory, Brisbane. Mr. R. A. Taylor, Clerk, Chief Office, has been appointed an Inspector under the Fertilisers Act, Pure Seeds Act, Stock Foods Act, and Pest Destroyers Act, Department of Agriculture and Stock.

Mr. W. R. Holmes, District Inspector of Stock, Townsville, has been appointed also an Inspector of Dairies. The Officer in Charge of Police at Theodore has been appointed an Acting Inspector of Stock. The services of Messrs. J. R. Canty (Temporary Inspector of Slaughter-houses) and J. J. Purcell (Temporary Stock Assistant) have been continued for six months as from the 1st January, 1931. The resignation of Mr. R. J. T. Kidd as an Inspector of Stock as from the 23rd December, 1930, has been accepted.

The appointment of Mr. P. J. Hughes as an Acting Inspector of Stock at Cania has been cancelled as from 1st January, 1931.

Mr. E. Graham, Under Secretary and Director of Marketing, or a Deputy appointed by the Minister, has been reappointed a Member of the Committee of Direction of Fruit Marketing for a further period of one year until the 31st December, 1931.

Banana Levy Regulations.

Regulations making provision for a levy on bananas were passed on the 1st September, 1927. Such levy is payable by growers of bananas marketed in Queensland, and the rate of the levy is fixed at 1d. for every £2 or part thereof of the nett proceeds realised from sales. The levy, which is made by the Committee of Direction of Fruit Marketing, operated until the 31st December, 1930. A regulation has now been passed extending the levy to all bananas marketed until the 31st December, 1931.

Branding of Bags and Packages of Fertiliser.

Regulation 10 under the Fertilisers Act has been rescinded and a new regulation inserted in lieu. This new regulation provides that, in addition to the printed label affixed to each package of fertiliser, every producer shall durably and legibly brand or stamp every package with a brand distinguishing and identifying all fertilisers sold by him or under his name in Queensland. The brands, marks, figures, or lettering appearing on any package of fertiliser must be such only as indicate the true producer of the contents of the package, and no person shall sell, pack, or supply fertiliser in a package unless all other brands, &c., have been first obliterated from the exterior of such package, and from any label attached thereto. This regulation has been rendered necessary to obviate the difficulties arising from the use of second-hand containers on which previous brands have not been obliterated before further use.

Traffic in Canary Seed.

An Order in Council has been passed giving the Canary Seed Board power to deal with traffic in that commodity. The Acts now provide that all canary seed must be delivered by the growers to the Board or its agent by the nearest practicable railway under conditions fixed by the Board by notice published in any newspaper circulating in the districts concerned. Except for delivery to the Board or its agent, no grower may remove any of the commodity from his premises without the prior consent of the Board. No person shall remove any canary seed except with a permit from the Board. Such permit will give the conditions and period of duration for such removal. The Board may refuse to grant a permit. The permit must be carried and be produced for inspection by any member or inspector of the Board or member of the police. These restrictions apply only to canary seed grown in the petty sessions districts of Toowoomba, Allora, Warwick, Clifton, Pittsworth, Oakey, and Stanthorpe. Any member or inspector of the Board or member of the Police Force may, at any place within a radius of 100 miles from the boundary of the said petty sessions districts, examine any vehicle suspected of carrying canary seed, and may seize any of the commodity found. The Commissioner for Railways or any ship-owner may, on the request of the Board, without incurring liability, refuse to carry any of the commodity.

Fatness is not Fitness.

Fat in a horse, like charity in a man, covers a multitude of sins. Is a horse slack in the loins and weak in the back? Lay on fat. Is he deficient in "second thigh" and muscle? Lay on fat. Are his ribs short or flat? Blubber will hide the defect. Many a raw beginner has been bitterly disappointed on taking home a prize-winner, and putting him on natural food, to find the brilliant performer in the ring dwindle into a lean and lanky weed, in which the seeds of cureless disease have been plentifully sown. But good judges should not be taken in by such tricks.

One argument brought forward in favour of fattening is easily disposed of. It is said that the farmer ought only to buy a horse that is a good "doer"—that is to say, a horse that does justice to his food. The answer is that a horse that really assimilates his food well will put on muscle, not fat; and it is muscle that we want. If a horse, instead of putting on muscle under wholesome treatment, puts on fat, that horse is not a good, but a bad "doer." Fat in a horse should be looked upon, not as a merit, but as a deformity and a disease.

Who can imagine that a trial of strength between a fat horse and a lean, muscular horse would have the same result We need to breed strength and wind—not beef. There is no physiological argument that can be brought forward in defence of fat against muscle, and lovers of horses hope to see the day when fat shall be considered as much a blemish in a carthorse as sidebone or roaring.—"Live Stock Journal" (England).

Cows' Water Consumption.

Knowing that a cow needs a great deal of water if she is going to produce a heavy flow of milk, which is made up of about 87 per cent. of water, an American scientist representative of the Department of Agriculture decided to find out how to get the cow to do more drinking. He located a modern dairy "barn" in which automatic drinking cups were installed for the convenience of the animals, and began sitting up with cows at night.

After several nights of constant observation he arrived at the conclusion that if they have the opportunity cows drink more between 5 o'clock at night and 5 in the morning than they do during the other twelve hours of the daily cycle. That, be believes, accounts in large part for the increased milk flow which follows the installation of automatic drinking cup equipment in the barns.

Reports indicate that water bowls increase milk production from a little to as high as 30 per cent., depending upon how much water the cows were able to get before the automatic system was installed.

Extension of Northern Pig Board.

The Northern Pig Board was constituted in 1926 for a period of five years ending on the 31st December last. An Order in Council of the 2nd October last gave notice of intention to extend the Board for a further five years, and, as a petition for a referendum was received within the prescribed time, a ballot was held, resulting:—

For the continuance	139 votes
Against the continuance	109 votes

As the majority was in favour of the continuance, an Order in Council has now been issued extending the Northern Pig Board for a period of five years as from the 1st January, 1931, to the 31st December, 1935.

Canary Seed Board.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, Brisbane, until the 20th January, 1931, for election as Growers' Representative on the Canary Seed Board for the period as from 1st March, 1931, until the 28th February, 1932.

Two such representatives are to be elected by canary seed growers, and each nomination is to be signed by at least five growers who have grown canary seed between the 1st day of March, 1930, and 28th February, 1931.

The Stanthorpe Fruit and Vegetable Levy.

Regulations have been issued under the Fruit Marketing Organisation Acts, renewing for another twelve months the levy on Stanthorpe fruit and vegetables. The levy is 10d. per ton on all fruit and vegetables grown within a radius of 40 miles from Wallangarra, and railed from any railway station from Wallangarra to Dalveen, and from Amiens to Fleurbaix, these stations inclusive.

Where more than one grower contributes fruit or vegetables to any one consignment, the total amount of the levy payable shall be paid in proportion by the different growers, there being a minimum of 1d. in respect of any one consignment by any grower who, in his own name or otherwise, contributes any fruit or vegetables to the consignment.

The extension of the levy has been made at the request of the Committee of Direction of Fruit Marketing. The manner of making the levy is that a resolution shall be passed by the Committee of Direction that the levy be made, and thereupon the Committee shall give notice prior to the 19th December by advertisement of the levy, and upon its publication the levy will be deemed to have been made.

The growers liable to pay the levy must pay it to the Commissioner for Railways on behalf of the Committee of Direction at the time the various consignments of fruit and vegetables are being railed.

The levy will be expended in the payment of any expenses attaching to its collection, the balance to form part of the general funds for administrative purposes, and be utilised by the Deciduous Sectional Group Committee. The levy will operate for twelve months as from 19th December, 1930.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE FOOD OF MAN.

MAN thinks he eats what he likes; in reality he is the slave of custom. Primitive man ate whatever he could get. The Australian ate flesh, fowl, and fish, not despising lizards, snakes, and grubs. His women dug up fern roots, yams and bulbs, and gathered the seeds of grasses and the scanty fruits of the bush. Only in the small area and short season when the bunya nuts were plentiful did he enjoy an abundant vegetable diet. Meanwhile in other continents man succeeded in domesticating various animals. His flocks and herds gave him a constant supply of meat and milk, and his fowls eggs. He also learnt to grow cereals, vegetables, and fruits. Under favourable conditions he had now a wide choice of food, and under the stress of hard conflict and much experience he evolved food customs of high value, which lasted him long. Later and more complex civilisation provided much more varied choice of diet, and his food customs changed slowly and for the worse. We have good evidence that the average food of the British race is less fitted to secure healthy manhood than that of many other living races.

It is only very recently that science has come to this conclusion, and only after very long and patient investigation, inquiries, and experiments. These are as yet far from complete, but enough has been established to show that civilised man is slowly deteriorating from foolish excess in some constituents of his diet, and from still more harmful deficiences in other constituents.

A Healthy Diet.

Just as a fire cannot live without fuel, no animal can live without food. Food supplies the energy consumed in muscular work and in all other vital processes; it supplies also the energy needed to maintain body warmth. This energy is derived mainly from two classes of food elements. Firstly, starches, sugars, and other bodies to which we apply the name carbohydrate form the main source of human bodily energy in most cases. Starches are largely contained in wheatmeal, oatmeal, barley meal, maize, potatoes, rice, sago, tapioca, arrowroot and other vegetable products. Sugars are found naturally in fruits, sugar-cane, beet, and honey. By chemical processes we obtain pure sugar and golden syrup. In these forms sugar is very often taken in excess. Milk contains a special variety of sugar. Secondly, a very concentrated source of energy is provided by edible fats and oils. These we obtain mostly from cream, butter, and fat meats such as bacon or suet, though they are also present in some vegetable foods, such as olives, peanuts, and cocoanuts.

We may compare the body to an engine and our food to its fuel, but our food has not only to supply the necessary energy—it has also to repair the wear of the engine itself. For this a third class of food elements, which we call proteids, is needed. There are many varieties of proteids, and these vary much in their food value. Animal proteids may be classed in order of value as those of milk, eggs, meat and fish. The two first and especially those of milk stand highest. Proteids are also contained in varying proportions in vegetable foods. They are most abundant in beans and peas, and to a less degree in wheat and oats. Man has great difficulty in obtaining all the proteids he needs from vegetable foods; to children it is impossible. More especially without milk it is impossible for children to thrive at their best, and after milk comes eggs. Proteids may also be used as a source of energy, but not an economical source. So used they are expensive to buy, and impose unnecessary work on the organs of nutrition and elimination.

The amount of proteid needed for the daily diet by adults is not large, and an excessive intake of meat is a common error. The young need considerably more proteid to provide for growth of the tissues as well as to keep them in good repair.

These three classes of food provide energy and repair the bodily engine, but they are far from constituting a complete diet. Excepting the bones, all the tissues of the body contain more water than anything else, and without a liberal supply of water life is soon cut short. Nor can we live without salt. For the bones and teeth we need lime and phosphates. These exist in green vegetables, but their best source of supply is milk. For this reason also milk is a most important food for all children. A small supply of iron is necessary—without it red blood cannot exist. For healthy persons sufficient iron is contained in green vegetables, egg yolk and meat. A minute proportion of iodine is essential to life. This is usually sufficiently provided for in green vegetables, but in some districts of Australia—not, so far as we know, in Queensland—the soil is deficient in iodine. Consequently the vegetables growing on it are also deficient, and growing children develop enlargements of the thyroid gland sometimes called goitres. The foods most rich in iodine are sea fish and oysters.

So far we have learnt much from the chemistry of food. But we have learnt also that animals carefully and liberally fed with pure foods containing all these chemical constituents surely and inevitably waste and die. Some substances unknown to the chemist are a necessary part of our diet. These we call vitamins and they must be the subject of another article.

THE EDIBLE PODDED PEA *(Kiefel).*

This vegetable, highly esteemed and grown by every farmer in Switzerland, Germany, and Austria, should not be confused with the local-grown "poor man's bean"; it is of much more delicate nature. Bringing a few seeds with me when I returned from Switzerland in June last, I was simply astounded at their rapid growth and development. While in Europe they attain a height of approximately 3 feet; they grew up to seven and producing pods liberally. The method of growing is just the same as that of any ordinary garden pea, on sticks. The pod should be picked when still green and tender, ends cut off and boiled for from ten to fifteen minutes. The pods must not be cut, and served with a white sauce are of a sweet and delicious flavour. It is essentially a winter vegetable for Queensland, as planting mine in September I experienced that it was already too late in the season. They thrive in any soil where peas will grow. From a marketing point of view it appears to me doubtful that it should prove a safe investment as the pods are very light and such a number go to the pound that the price automatically would be high, but to grow them for home consumption they may be highly recommended as a very delicious vegetable.—PAUL DONNIER, Kelvin Grove, Brisbane.

VALUE OF ROTTED MANURE.

"Rotted manure" is a term frequently met in gardening handbooks, and questions are often asked regarding its value in comparison with fresh manure. Rotted manure varies very little in composition from fresh, but on the whole is somewhat richer, owing to the fermentation of the insoluble organic matter, the disappearance of which increases the proportionate amounts of soluble organic matter and fertilising material, especially organic nitrogen compounds and phosphate of lime. Old manure is not so likely to burn the plants as fresh manure, which becomes hot owing to fermentation. The preliminary heating that old manure undergoes is also likely to destroy the germinating power of any weeds it may contain.

Fresh manure, owing to its loose texture, has a tendency to cause the soil to dry out, and on light soils, especially during the warm months, its application may be harmful. It should, therefore, be applied some time before the land is required for cropping. If land into which fresh manure has been dug is cropped immediately, frequent waterings must be given in order to regulate the soil temperature and prevent overheating through the manure's rapid decomposition.

From the foregoing it will be seen that well-rotted manure is much to be preferred to fresh.

THE FLOWERS OF THE BUSH.

World travellers may revel in the beauties of the sea, of landscapes, of waterfalls, of mountains, and of snow, but our natural beauty spots—the home of our native flora—present scenery unsurpassed in any part of the world.—Mr. Harry F. Walker, Minister for Agriculture and Stock.

INTRODUCED by Mr. Harry F. Walker, the Native Plants Protection Bill, having for its object the preservation of indigenous flora, met with a cordial reception in the Legislative Assembly just before the end of the last session, and some notable speeches, from which the following extracts have been made from the "Hansard" report, were delivered on its second reading.

SPEECH BY THE MINISTER.

In commending the measure, Mr. Walker said that although it was a small Bill, and one which might be regarded as having very little commercial value, still it was necessary, for it was their bounden duty to preserve the beautiful flora in which Queensland is so rich.

At the outset it was well to remember that in this country Nature had endowed its people with a fund of great beauty in its native flowers, ferns, and orchids. World travellers might revel in the beauties of the sea, of landscapes, of waterfalls, of mountains and of snow, but their natural beauty spots—the home of their native flora—presented scenery unsurpassed in any part of the world.

Although at the present time (continued Mr. Walker) we may not value these plants, in the future they will be of immense value. I went for a walk the other week, and I saw carload after carload of ferns and orchids coming from Mount Tambourine. One may see carloads of native flora coming in every Sunday; and I do not think this is a fair thing, and it should be prohibited. Of course, many scrubs are held privately at the present time. It may be necessary to cut these scrubs down, and I would sooner see the ferns given away than burnt. We should, however, prevent the wholesale destruction of our native flora. We have some wonderful orchids in Queensland, and they can be found from Southern Queensland right up to North Queensland. On Mount Tambourine, on the Blackall Range, and in the scrubs of the Mary Valley, and on the Atherton Tableland we have a very large variety of beautiful ferns and other flora which will be appreciated more as years go on.

Something like twenty-five years ago the Department of Public Lands made several reservations between Brisbane and Gympie, and anyone travelling by train has only to look at these reservations to appreciate their value. These reservations give the public some idea of the beauty of our coastal jungles. Only recently I found that many of the trees on these reservations had been ringbarked for a paltry sheet of bark. That is an impossible state of affairs. I should like to see these reservations handed over to the administration of the Railway Department so that the lengthsmen could see that the flora is properly protected. The same thing would apply to many other reservations where the lengthsmen going to work would consider it a pleasure to stop the wilful destruction of the flora that takes place from time to time. On the Kyogle line there are some of the finest beauty spots possible, abounding in ferns, orchids, and all kinds of plants. These areas are too rough for commercial use. The commercial timber has been taken away; but the natural scrub is left, and these areas should be reserved for the protection of the native flora. It is in the rugged gullies that you see the tree ferns; but, unfortunately, the motor car has brought these places within easy distance of the metropolis. Again, motor picnic parties go up our rivers, and they come back loaded with valuable plants plucked indiscriminately.

Information we have received gives some idea of the wilful destruction that has taken place on the islands of the North. In the case of the islands, particularly those in Torres Strait and the Barrier Reef, the matter is still more serious, inasmuch that the plants, particularly orchids, are exported in enormous quantities overseas to China and other countries in Eastern Asia.

We have also proposed to investigate the possibility of the planting by local authorities of grasses and other plants along river banks and foreshores to prevent erosion or stabilise moving sand dunes. As hon. members are aware, all along the coast of Queensland vast quantities of sand are blown away by the wind. It has been found in the Rockhampton district that one grass in particular can be grown

on the foreshores for the purpose of binding the sand and preventing its removal. Something of this sort is very necessary at almost all our seaside resorts. We find that in the Rockhampton district much harm has already been done, and the Bill will help us to protect the shores in this way.

It is also proposed to carry out experiments of a commercial character out West. I understand that the Commonwealth Government went into the matter to a certain extent, but there is no reason why we should not carry out experiments to see whether sheep and cattle will not eat something else besides grass. I can assure hon. members that there is plenty of scope for investigation. If we planted shrubs on Government reserves, no matter how expensive those experiments might be, we would have to pass legislation for the purpose. We might even have to acquire land, but, under the Bill, the Government, local authorities, or any other public body may make a recomendation with a view to the proclamation of an area to which the protection of the Bill may be extended.

A Common-sense Measure.

I have run roughly over the provisions of the Bill, and I am sure that hon. members must have gained some idea of what the Bill sets out to do. It is a measure which we ought to pass. If we go on in the way we have been doing as regards native plant life, the time will soon arrive when we shall have little or none of it left. Hon. members will readily appreciate that our orchids, tree ferns, and staghorns are being destroyed, and how they might easily be grown again. At Sandgate or any of our coastal suburbs there is nothing to prevent them from being replanted and growing as luxuriantly and beautiful as ever. Hon. members may say that the local authorities have power to deal with the matter; but, unfortunately, they have not got enough power, and they have repeatedly asked for greater power. This Bill is designed not only to give them greater power, but also to give the Government the necessary extreme power to protect the areas I have described. The Bill is a common-sense measure, and I am sure it must commend itself to hon. members.

SUPPORTING SPEECHES.

Mr. Bedford's Address.

Mr. RANDOLPH BEDFORD (*Warrego*) congratulated the Minister and the Government on the introduction of the Bill.

It is only recently (he added) that a similar measure was introduced in New South Wales, where the need for it was much greater than it was in Queensland, owing to the larger population and the consequent greater proportion of hoodlums, Goths, and vandals intent on the destruction of indigenous plants.

I disagree with the Minister in thinking that there is no financial side to this question. If you destroy the beauty of a country, which is intended to be one of the finest tourist resorts on earth as soon as the world begins to know it better, then you are surely destroying a large amount of the attractive power, which means money. I understand from the Minister that £20,000 worth of the plants on the islands are alleged to have been sent to Germany in one year.

The Secretary for Agriculture: I was told so.

Mr. Bedford: I thoroughly believe it. These people on the other side of the world have a more lively interest in these things, and a greater sense of the value of this unique beauty, which we despise because it is so close to our doors. They value it because of its exotic value; but we dispise its value because of its commonness. I remember, in Tokio some years ago, seeing 4,000 Carpentaria finches in cages, and I was so annoyed at seeing my fellow countrymen in such circumstances that for the moment I had the one idea of opening the cage and allowing them to go. I decided, however, that, if I did let them go, they would still be in Japan; and as there were a thousand indignant Japs standing around, I decided to take my feelings with me away to Australia. (Laughter.)

AUSTRALIAN FLORAL BEAUTY.

Australian floral beauty is appreciated by very few people. Mrs. Ellis Rowan made a labour of love drawing Western Australian wild flowers until later she got a gallery of 400 pictures. The lady never made a penny out of it; but, after her death, I believe they were sold to a foreign collector for £10,000. Anyone who has seen the beauty of 20 to 30 miles of amaranths on the Western Australian plains, or 10 to 15 miles on Sturt's Meadows, outside Broken Hill, of the black and red Mephistophelian beauty of Sturt's desert pea, knows that every part of Australia

has its own distinctive beauty which must be recognised and protected. The shame is that Australia was nearly 160 years old before there was ever any attempt made to protect the local flora, particularly in the oldest State of the lot—New South Wales.

When Captain Cook arrived on that day in April 160 years ago, not seeing the country at its best, and yet named it Botany Bay, one would have thought that that was the beginning of the recognition of the beauty found in those early times. But for the first forty of fifty years of Australian settlement the early comers to Australia cursed the country for its ugliness and its barrenness, because they sowed wheat in March and expected it to be at its best in June, as was the case on the other side of the world. Of the number of officials who came to Australia in those times this country had only half a dozen friends, Captain Phillip—one of the best men who ever opened up a new country—and Banks, Solander, Bass, and Flinders had the scientists's mind. . . .

We have seen native trees destroyed, and foreign trees grown—not in the bush, but in civilisation and in the cities. We have seen the kangaroo, emu, and the lyre bird killed and the rabbit and the fox introduced—the rabbit allegedly as food, and the fox for the alleged sport which Rudyard Kipling described as "the pursuit of the uneatable by the unspeakable." (Laughter.) Similarly prickly-pear, St. John's wort, sweet briar, and all such vegetable pests have been imported, and distinctive Australian flora—flora of the oldest country geologically in the world—ruthlessly destroyed.

The gum-tip craze of the suburbs has wiped out large quantities of forests around Sydney. The little remnants of forests that have been left, including the waratah, have been destroyed. . . . One can only visualise the wonder that Sydney must have been before man destroyed it by finding up the Hawkesbury occasionally in some almost inaccessible canyon the waratah, the native rose, the giant lily, and other samples of Australian flora.

To-day with the advent of the motor-car the ability of the hoodlum to destroy this beauty has been increased a thousandfold, and it has been necessary in New South Wales to introduce a Bill with more drastic penalties than are provided in the Bill now under discussion. The Act there permits of immediate arrest, and the penalties are just as great as they are here, but the arrest is certainly necessary. . . .

America has largely destroyed all her rural beauty except those which have been State protected. A tremendous amount of money has been spent in making those tourist resorts. The American owner of private land is the man who is continually cursing the motor magnate who descends on his land and, finding it beautiful, leaves it ugly. . . . There was a man named Victor Daly—a pure Celt, a poet—who lived in Sydney, and who could take this extremely spiritual view of a thing which most people destroyed in ways most grossly material—

"I smell the rose upon the tree,
Who will may pluck and wear for me,
May wear the rose and watch it die,
And leaf by red leaf fade and fall,
Till there be nothing left at all
Of its dear loveliness, but I
Love it so well I leave it free:
The scent alone I take with me."

The majority of people would not only have taken it, but would have taken it by the roots and either have deserted it or sold it for twopence to a Chinaman. (Laughter.)

Slowly we are using Australian eyes to see the beauty of our own marvellous land. There is a fine firm of seedsmen and nurserymen in Sydney—Yates and Company—who have taken on the beautiful things of the Sydney sandstone country—the waratah, the native rose, the flannel flower—and have brought them to such a stage of perfection in their own nurseries that now you can buy them as you would any imported plant. There are very few in Queensland, because no one has ever decided to transplant the beauties of the Sydney sandstone to the Brisbane schists. I have made the waratah bud here from sticks, which is another proof of the wonderful country we have here. The Greater Brisbane selection of city flower shows generally the disregard we have for the Australian flora. The city selected the poinsettia; the bougainvillea had a large vote. The real flower that should have been selected to represent this city is the calistemon, which is equal in colouration and fairer in form. The Scotsman, for instance, takes the thistle. He is entitled to it.

There may be beauties in it to the Scotsman, but they are certainly hidden by the prickles round it. The rose is alleged to belong to England, but it belongs to anywhere from India to America, and it does just as well here as anywhere. The real symbol of Australia—virile, manly, not asking much from anybody but a fair deal—is the waratah.

I notice in this Bill that there is to be no discrimination, or at least little discrimination, between the real nature lover, who is merely taking flowers out of his turn, and the flower destroyer. Certainly there have been abuses in New South Wales through giving the quasi-scientist the right to destroy. They may be quasi-scientists on Thursday, but, once they are given a permit from Friday till Sunday, they are quite as bad as anyone else. Still, if any consideration is given in this Bill to the offender, it should be given to the gardener—the man who is taking plants to be grown—as compared with the man who is taking plants which will be thrown away at the first opportunity. . . .

I congratulate the Minister on the Bill, and I believe that the Government did a good thing in bringing it forward, as by this means we shall have a chance of maintaining and keeping the natural beauties of our land for our grandchildren, which, without this legislation, they would have no chance of seeing Australia as it was and still is.

Speech by Mrs. Longman.

Mrs. Irene Longman, member for Bulimba, also congratulated Mr. Walker on the Bill. He had, she said, anticipated the wishes of flower lovers and field naturalists throughout the State. It seems to me (added Mrs. Longman) that it is an adequate Bill, and it will result in keeping for us many of the wonderful floral beauties of Queensland. . . .

AUSTRALIAN FLORA UNIQUE.

I think we could all grow lyrical in describing the beauty of our flowers. Our flora is as significant as our fauna. We hear so much about the unique animals of Australia—the koala, the kangaroo, and the other marsupials; yet there are very few people who have realised in the past that the flora of Australia is also unique. The early explorers and visitors to the shores of Australia soon found that out, and it was no wonder that they looked upon it and spoke of it as being a new world. It was a new world to them—a world of new flowers, new trees, and new animals.

Mention was made by the hon. member for Warrego of the pictures painted by Mrs. Ellis Rowan, which are very beautiful, indeed. The hon. member mentioned that they were paintings of Western Australian flowers, and I should just like to point out to those who do not know that she painted just as many flowers belonging to Queensland as to Western Australia and the other States, and at present we have a great number of her works in our museum. Some of the early explorers and scientists who have been mentioned, such as Banks and Darwin, have written very extensively about many of our plants and flowers, which are still, fortunately for us, in existence, although we have had no protective legislation heretofore. In New South Wales the introduction of a somewhat similar measure resulted in the prevention of vandalism which was fast leading to the extinction of wild flowers in that State. We are taking time by the forelock in Queensland, and I feel that, when this Bill is in operation, we shall have gone very far along the lines which all flower lovers and scientists throughout the States have been hoping for. . . .

As a matter of fact, I think most types and most classes of people have had a hand in this plant destruction. We do want to preserve the beautiful flowers of which we have heard so much to-night—the boronias, the epacridaceæ, the many proteaceæ, among them the grevilleas, one of the most showy of which is the silky oak. We have also many beautiful orchids, both epiphytic and ground orchids, which should be safeguarded. The Minister has spoken of these, and there is no need for me to dwell upon them. There is a plant in the northern parts of Queensland which may be in danger, although there in such quantities, because we know that people have been tearing them out by the roots. I speak now of the Byfield fern, or Bowenia. This belongs to the Macrozamias, a family of long lineage, which are found in fossil form.

If this Bill results in the saving of these flowers and ferns and other forms of our flora throughout Queensland, it will have done a splendid thing. In New South Wales they have gone a little further than we are going in this Bill. I understand that they are prohibiting the gathering of certain wild flowers. I think the Minister has been wise in not doing that, for one of the most pleasing features of social life to-day throughout Australia is the fact that people have begun to appreciate the flowers of our bush.

This appreciation has become more general throughout Queensland of late years; and I think it would be a very great pity if the gathering of flowers was prevented. As a matter of fact, not only the country flower shows but also our National Show and the wildflower show that is held annually by the field naturalists provide centres of education not only for children but also for adults. People are beginning to realise that there is a way of picking these native flowers without destroying them, which in the past was not well recognised.

DRESSMAKING AND FANCY STITCHERY.

By Miss ELLIE CAMPBELL, Inspector of Domestic Arts, Education Department, South Australia.*

SUMMER is here, so thoughts turn to frocks and clothing. The wardrobes are turned out, and the contents looked over for renovations or replacings. In the planning and scheme of work, perhaps the following hints might be of some help to the woman who is distant from the costumiere or dressmaker, and has to depend on her own efforts. Unfortunately, all phases of home dressmaking could not be dealt with in one article, for it would become a volume, so just a few important points are selected.

Nowadays the designers and the commercial pattern companies have done much to assist in simplifying dressmaking for the housewife; thus with a little care and effort the clothing account can be considerably reduced. Several firms prepare and publish pattern for styles illustrated in their fashion books. There are two ways of procuring a commercial pattern; the most common way is to carefully look through a fashion book, and select the style of frock that is most becoming, then the pattern is ordered according to the bust measurement for a blouse, jumper, or frock, or to the hip measurement for a skirt. These patterns are drafted in proportion to the measurements of an average figure. The second way to procure a pattern is to send the measurements of the person to the firm, and indicate the style of garment that is required; they then draft the pattern—this is a surer way of obtaining a good fit.

A garment must fit the body well for the person to feel comfortable and at ease in it. If it fits well it will grace the line of the body, and will have a distinctive look. To send the measurements to the designers, it is well to know just where and how to take the measures, also they are very handy in order to check the size of a "commercial" pattern. The person should stand naturally, and the arms should not be raised nor the head lowered whilst the measures are being taken. The diagrams following will show where to take the various measures.

The neck measure should be taken comfortably, not too loosely nor too firmly.

The shoulder measurement is taken from where the neck joins the shoulder to the top of the arm joint.

The cross chest should be taken firmly across the chest, above the bust line, just where the arms join the body. The bust measurement is taken right around the body under the arms, passing over the shoulder blades and across the fullest part of the bust. It should be a loose measurement, to allow for expansion of the chest and for free movement. The waist measurement should be firmly taken around the body a little below the ribs. This is not always the waist line of the frocks—that is obtained when designing the gown.

The underarm is taken down the side from the armpit to the waist line.

The cross back is taken above the bust measurement, where the arms join the body.

The hip measurement is taken loosely, 7 in. below the waist. This measurement has to allow for the spring of the legs and body.

The down front measurement is taken from the point where the neck joins the shoulder, over the bust, down centre front to the ground. The height of the edge of hem above the ground is to be deducted to give the correct down front length of frock. The down back is taken from the bone at the nape of the neck to the ground, and the height of hem above ground deducted as for front measurement.

The sleeve measurement is taken with the arm bent, the hand resting on the chest. Measure from top of shoulder joint, around point of elbow to the wrist bone. This allows for the bend of the arm.

Wrist, measure around the broadest part of the hand, keeping the thumb in the palm of hand.

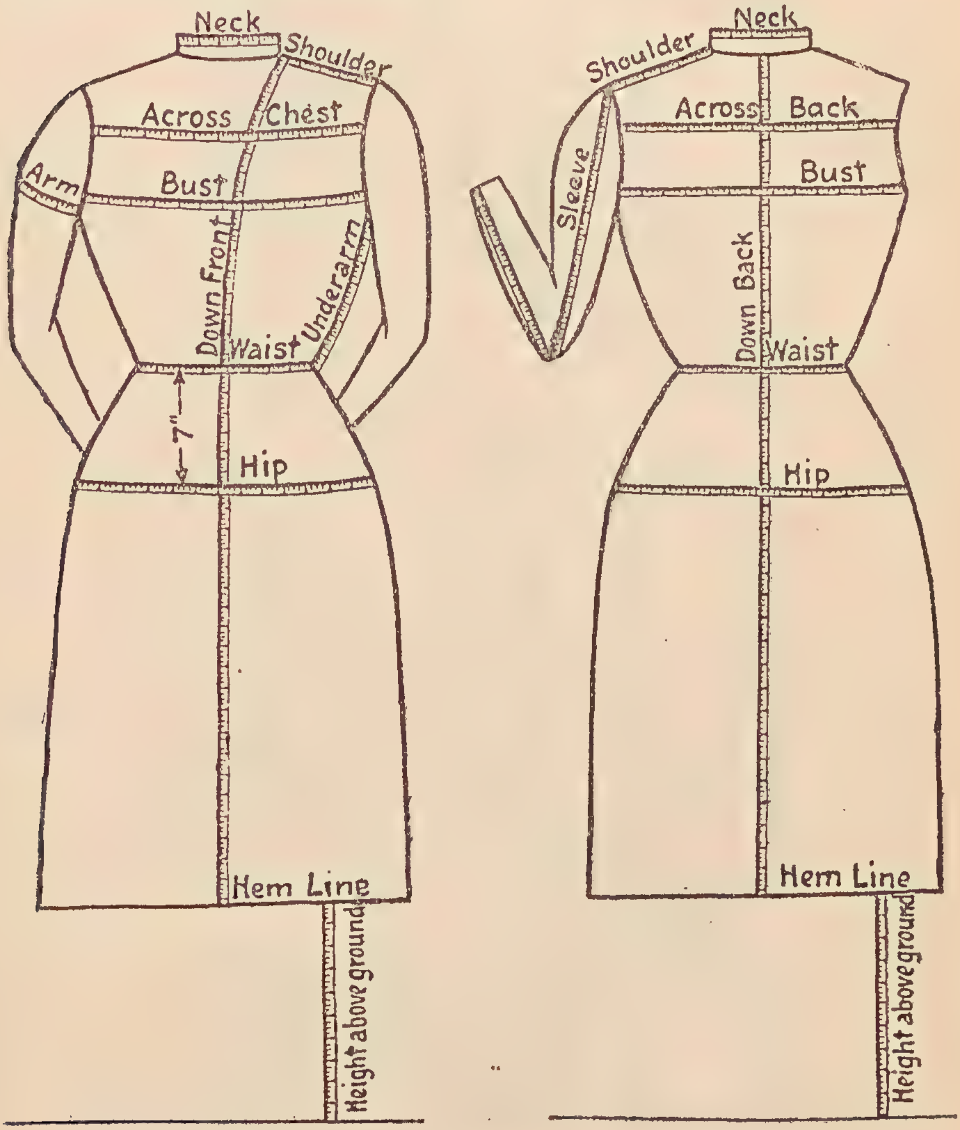
It is most important that these measurements be taken very accurately, as the whole fit of garment will depend on them, also the amount of material to be used will be governed by the pattern. With these measurements the commercial patterns can be tested and adjusted.

In order that the pattern may be pieced together properly, various methods have been devised to indicate the pieces to be joined; it is necessary to understand and read the patterns. One method is the use of lines, arrows, and wording. The broad dark line is the cutting line; the fine broken line is the seam line; the double arrow indicates the way of the grain of the material—that is the way of the threads, not the pattern of the material; thus it can be a crossway grain or a lengthwise grain, the way of the selvedge, the darkened notches are numbered and they correspond.

---

* In the Journal of the Department of Agriculture, South Australia.

Another method is the use of perforations. Large punctures in pairs, in a line, are used to indicate the way of the grain, smaller punctures marking the seam line; yet smaller punctures to indicate tucks, gathers, or pleats. The edge of the paper pattern is the cutting line. Folds are indicated by three punctures forming a triangle. It is most essential that the pattern should be placed on the grain of material correctly, as this affects the hang of the garment.



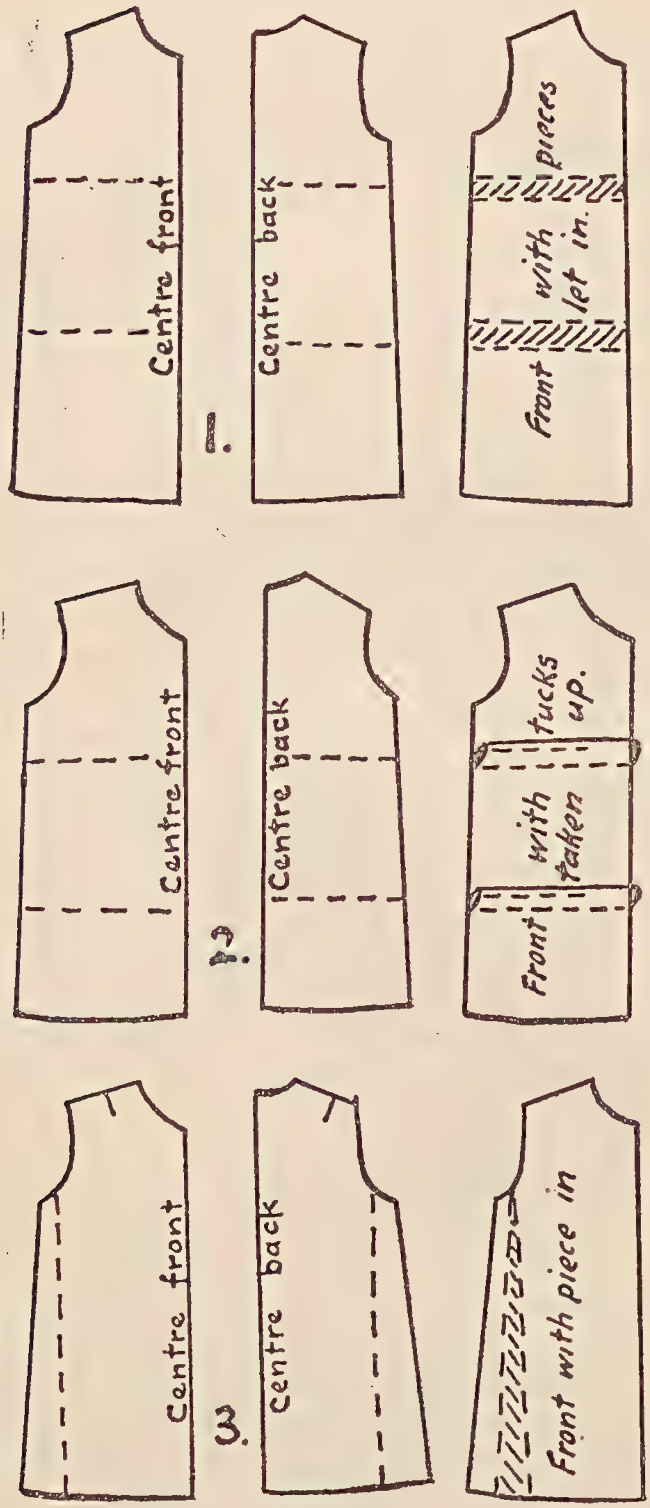
FRONT BACK.

Having read and tested the pattern, some slight alteration might be necessary to give good fit. Following are a few suggestions for keeping the line and design, although altering the measurements:—

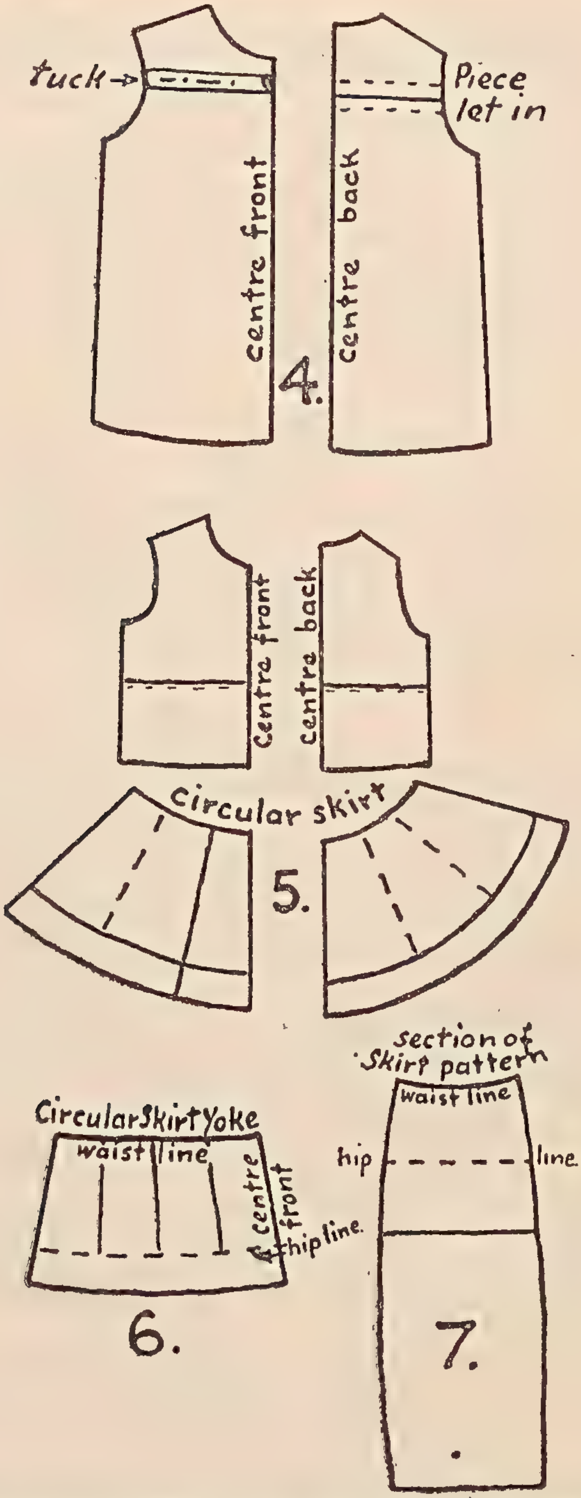
1. To lengthen pattern 3 in. or 4 in.—Cut across the front pattern 2 in. above waistline, and spread pattern $1\frac{1}{2}$ in. or 2 in. Cut across the front pattern below hip-line and let in the necessary $1\frac{1}{2}$ in. or 2 in. This will give the extra length.

Cut the back pattern to correspond.

2. To shorten pattern 4 in., place an inch tuck across the pattern between the waist and bust lines, also another inch tuck below the hip-line.



3. To widen a pattern that is tight at the hips, cut pattern from a point 2 in. in from corner of armhole down to hemline, and spread the necessary amount; fasten to new paper. This will give extra width for hips and spring of legs when walking.



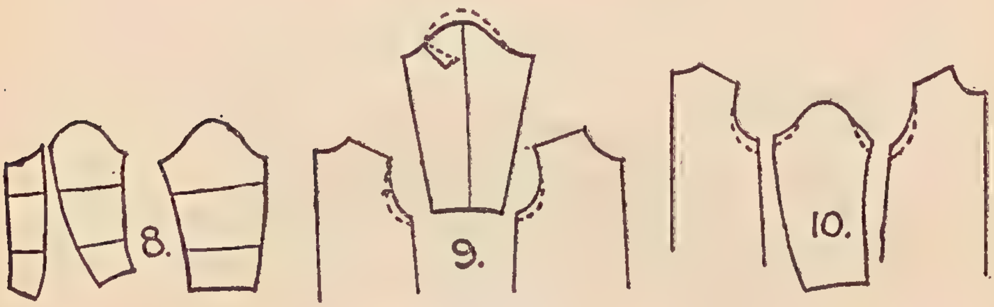
4. To alter pattern to suit a round back and flat chest—Cut pattern along line of cross back measurement and spread it the necessary amount. Put a tuck in the front on cross chestline, taking up the same amount as was let into back. Add same amount to lower edge of front to adjust the hemline.

5. To shorten a pattern with a circular skirt—Place small tuck in bodice, between waist and bust lines. Cut skirt pattern in more than one place, being careful to have even distance top and hem. Spread to allow the new hemline to have same measurement, and cut off extra length, being sure to keep the circular cut.

6. To make a circular yoke pattern larger at the hips—Cut the pattern in three places, from the waistline to the hipline, and spread the necessary amount.

To shorten the waistline of circular yoke—Place three tucks in yoke, at equal distances, taking up the extra length between them; taper the tucks from waist to hipline.

7. To adjust length of skirt pattern, that has two or more pieces—Make tucks, or let in extra length, 6 in. below hipline.



8. To lengthen or shorten sleeve pattern, make the adjustments above and below the elbowline, by either letting in the extra length, or taking up the extra amount in tucks.

9. To make a fuller sleeve, cut from top of curve to middle of cuff, and spread pattern to arm measurement, adjust curve by equal amount that is taken up in pleats in pattern. Adjust armholes equal amount.

10. To make deeper armhole, an equal amount must be cut from back and front of bodice pattern, also both sides of sleeve curve. Be careful to deepen both sides.

When the pattern is adjusted to the required measurements, it is advisable to place the whole pattern on the material, before starting to cut out. Often an appreciable amount of material can be saved with careful placing; take time to think it out, then thoroughly look over the placement. Do not be in too great a hurry to cut, as a wrong cut often wastes material. To prove the pattern, before cutting out in expensive cloth, make the garment up for a housefrock in a cheap material, such as zephyr or cambric. This will often give confidence and assurance that the better garment will give satisfaction.

Careful and neat finishings are advisable, as the seams and hems are strengthened. There are two kinds of seams: the French or double seam, and a flat seam. In this seam it is necessary to neaten the edges of the material to prevent fraying; this can be done by either overcasting the edge, and keeping it flat, turning the raw edge in and machining down, or by nicking along the edge of material (this is known as pinking the edge).

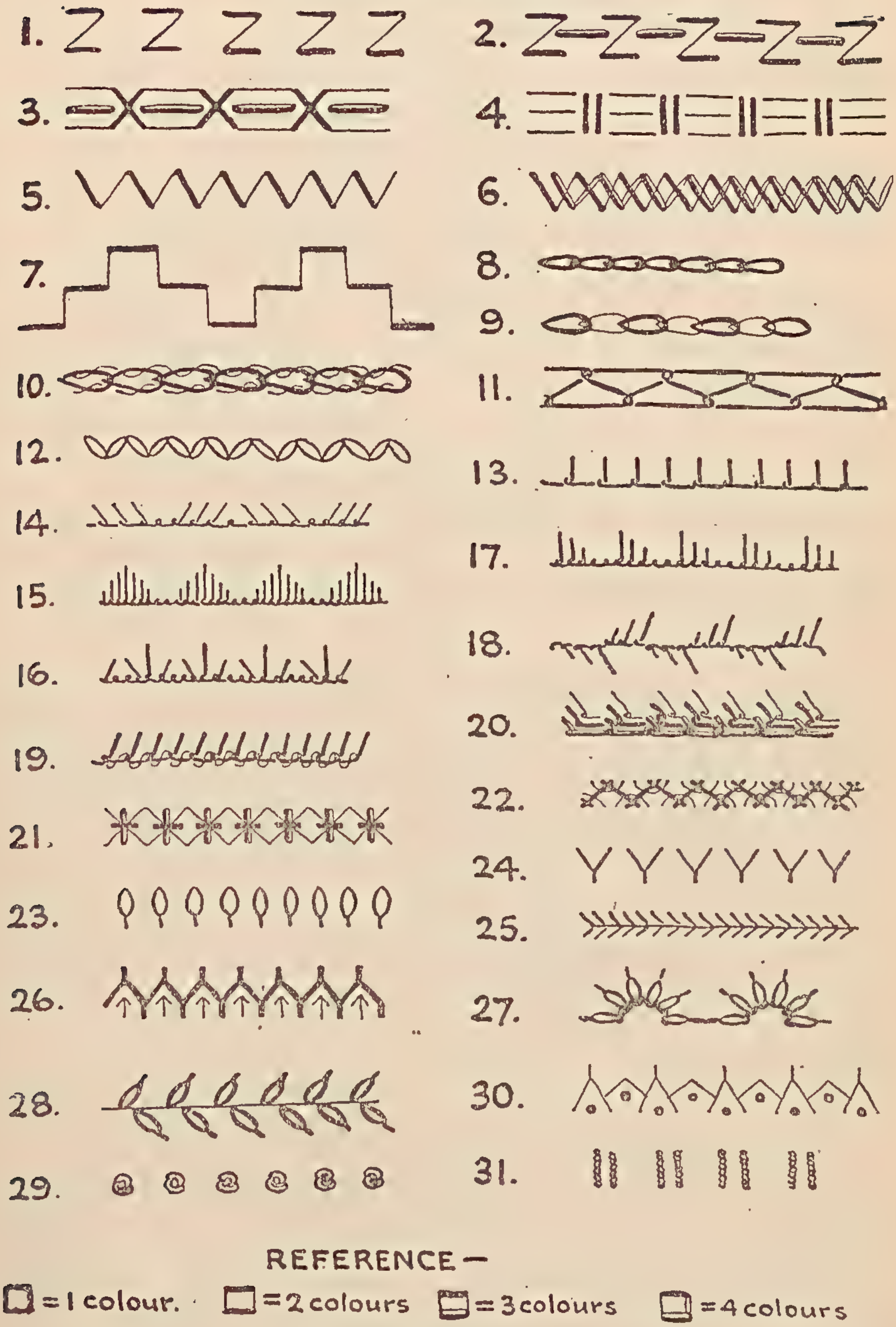
The neck, and sometimes the hem, can be bound by a bias bind—here the bind must be on the true cross, or bias, for it to sit correctly. Necks and cuffs can be faced and piped; the facing should be cut similar to the part to be faced. Hems can be slip-stitched, or if light material, hemstitched. Buttonholes can be worked or bound, and they should be carefully finished off.

The finishing leads to longer wear and service of the garment. The appearance of the garment, especially in children's clothes, is often improved by a little simple stitchery around the collar, cuffs, and hem.

A few well-known and selected stitches that can be used for this purpose are here illustrated and explained:—

EDUCATION DEPARTMENT, S.A.- DOMESTIC ARTS.

FANCY STITCHES.



KEY TO STITCHES.

1. *The "Z" stitch,* large running stitch joined by hemming stitch.
2. *The "Z" stitch* linked by a row of tacking.
3. *"Link" stitch,* two rows of tacking joined by a "Cross" stitch, and linked with another row of tacking.

4. *"Post and Rail" stitch,* three rows of running, with two upright tacking stitches.
5. *The "V" stitch,* hemming two ways.
6. *The "Diamond" stitch,* two rows of "V" stitch overlapping.
7. *The "Step" stitch,* horizontal and upright darning.
8. *The single chain stitch.*
9. *"Magic" chain,* the chain stitch worked in two colours.
10. *"Laced" chain,* the single chain stitch, laced with a different colour.
11. *"Double" chain,* the chain stitch worked openly.
12. *"Zig Zag" chain,* the chain stitch worked on the slant.
13. *"Blanket" stitch.*
14, 15, 16, 17, 18. Variations of *"Blanket" stitch,* suitable for hems.
19. *"Laced" blanket,* simple lacing into "Blanket" stitch.
20. *"Battlement" stitch,* three rows of "Blanket" stitch done on the slant.
21. *"Star" stitch,* cross stitch, running through the cross and upright tacking.
22. *Laced Herringbone stitch.*
23. *Lazy-daisy stitch.*
24. *"Y" stitch,* open lazy-daisy stitch.
25. *"Feathery" stitch,* the lazy-daisy stitch worked closely together.
26. *"Gable" stitch,* two rows of arrow stitch with a tacking stitch.
27. *"Sun" stitch,* lazy-daisy stitch worked in half-circles.
28. *"Leaf" stitch,* lazy-daisy stitch and a darning stitch
29. *French knots.*
30. *"Tent" stitch,* lazy-daisy hemming, and French knots.
31. *Bullion stitch.*

THOROUGH CULTIVATION ESSENTIAL.

All farming experts are unanimous on the need for frequent and effective cultivation for growing crops and stress also the advisability of originally ploughing to a sufficient depth to suit the crops which are used. Crops like maize, sugar-cane, &c., need a much greater depth of cultivated soil than does wheat, for instance, and the best results are obtained only through ploughing to the right depth and then when crops are growing, and by special care that cultivation is carried out at intervals of sufficient frequency to prevent loss of evaporation through the soil.

Because of this necessity for proper ploughing and cultivation, all farmers and orchardists should make a special point of keeping in touch with latest developments in agricultural machinery. The principle of rotary tillage has for a number of years engaged quite a lot of attention not only in Australia but in the United States as well, but in our country much greater strides have been made in the production of a really efficient rotary cultivator for use in conjunction with ordinary farm tractors.

One of the main developments has been that of the Howard Rotary Hoe, which, for those who have purchased them, have proved entirely satisfactory.

A rotary hoe fitted to a tractor is capable of carrying out the whole of the ploughing and cultivating required on any property. The heavy breaking up is done by means of pick tynes, and with a given power of tractor will do a greater width of cut to a greater depth than is the case with any other implement available. This greater work is accounted for by the principle under which the rotary hoe works. The power for driving it is taken direct from the power taken off on the tractor, then though spiral bevel gearing running in oil. There is, therefore, practically no loss and absolutely no drag as is the case with ordinary disc implements. The rotary hoe turns every horse-power into effective cultivation and gives the best results for the horse power and consequently the fuel which is used. For the Howard Rotary Hoe, Buzacott's (Queensland) Limited, of Adelaide street, Brisbane, are the agents, and any inquiry to them will meet with an immediate response.

Orchard Notes for March.

THE COASTAL DISTRICTS.

If the weather is favourable, all orchards, plantations, and vineyards should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

Cooler weather may tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destination in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations which are apt to become somewhat dirty during the gathering of the crop must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specked fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is 10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case for mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the

Southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit fly must be systematically fought in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codlin moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking-moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moth will soon be thinned out.

Strawberry planting can be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be carefully followed. The latter varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes, and it is pleasing to note that some growers are packing their fruit very well. Those who are not so expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of requiring water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much water is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light irrigation is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

CONCRETE ON THE FARM.

Many inquiries have been received from time to time in regard to the correct mixture to use in the preparation of concrete for pig feeding troughs and floors, for it has been found that for floors of dairies, piggeries, and other places where milk is used, the ordinary mixtures of concrete are damaged by the action of lactic and other acids.

From an economic and practical point of view, concrete is satisfactory, but it must be composed of a finely grained hard aggregate and be laid down under the best of conditions to be permanent. Both brick and a coarse broken stone composition of concrete are unsuitable where impermeability and resistance to acids are essential.

A rich dense mortar composed of sand and cement only, in the proportion of not more than three of sand to one of cement, with a hardener resistant to lactic acid and abrasive action added, is required for rendering (or topdressing).

To overcome the effects of the lactic acid in eating into the concrete and causing a very rough surface, it is recommended that when the mixture is being prepared either one or other of the following hardeners be incorporated in quantities advised by manufacturers of these products, viz.:—Toxement, No. 421, Pudlo, Calemanoid, or Novoid. Merchants handling sand, gravel, and general hardware would readily advise regarding their use. These hardeners also prolong the life of the cement.

Farm Notes for March.

Land on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—i.e., spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for twenty-four hours and subsequently aerated and stored in airtight containers. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags, or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which were too far advanced to benefit by the recent rains, and which show no promise of returning satisfactory yields of grain, would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

BERKSHIRE FARMER'S RUSE.

A humorous story was told recently to Essex surveyors by Mr. Benaiah W. Adkin, Principal of the College of Estate Management. Referring to his early experiences as an articled pupil with a firm of agricultural auctioneers and land agents in Berkshire, Mr. Adkin recounted the yarn of a Berkshire farmer who was notorious for always getting the best of any bargain with a butcher. He kept a good cellar and always entertained the butchers most royally before broaching the question of business. When the time came to inspect the beasts he always refused to leave his sitting-room himself on account of gout, and pointed out the beasts to the butcher through the sitting-room window. The explanation of his successful bargaining was discovered when he died, when it was found that the sitting-room window was glazed with glass of a very high magnification.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

Date.	February, 1931. Rises.	February, 1931. Sets.	March, 1931. Rises.	March, 1931. Sets.	MOONRISE. Feb. 1931. Rises.	MOONRISE. Mar. 1931. Rises.
1	5.26	6.44	5.48	6.22	p.m. 5.30	p.m. 4.2
2	5.27	6.44	5.48	6.21	6.28	5.3
3	5.28	6.43	5.49	6.19	7.15	5.47
4	5.29	6.42	5.50	6.18	7.55	6.24
5	5.30	6.41	5.51	6.17	8.32	7.0
6	5.31	6.40	5.51	6.16	9.7	7.35
7	5.32	6.40	5.52	6.15	9.41	8.11
8	5.33	6.39	5.53	6.14	10.16	8.48
9	5.33	6.38	5.53	6.13	10.52	9.29
10	5.34	6.37	5.54	6.11	11.35	10.16
11	5.34	6.37	5.54	6.10	...	11.8
12	3.35	6.36	5.55	6.9	a.m. 12.22	...
13	5.36	6.35	5.56	6.8	1.15	a.m. 12.3
14	5.36	6.35	5.56	6 7	2.10	1.0
15	5.37	6.34	5.56	6.6	3.5	1.54
16	5.38	6.34	5 57	6.5	4.1	2.50
17	5.38	6.33	5 57	6 4	4.57	3.46
18	5.39	6.32	5.58	6 3	5.52	4.40
19	5.40	6.32	5 58	6.2	6.45	5.32
20	5.41	6.31	5 59	6 1	7.37	6.23
21	5.42	6.30	5.59	5.59	8.27	7.15
22	5.43	6.29	6.0	5.58	9.18	8.8
23	5.43	6.28	6.0	5.57	10.15	9.2
24	5.44	6.27	6.1	5 56	11.11	10.3
25	5.45	6.26	6.1	5.55	p.m. 12.10	11.2
26	5.46	6.25	6.2	5.54	1.10	p.m. 12.1
27	5.46	6.24	6.2	5 53	2.10	1.0
28	5.47	6.28	6.3	5.52	3.11	1.58
29	...	...	6.4	5.51	...	2.52
30	...	...	6.4	5.50	...	3.38
31	...	...	6.5	5 49	...	4.17

Phases of the Moon, Occultations, &c.

3 Feb.	○	Full Moon	10 26 a.m.
10 ,,	☽	Last Quarter	2 10 a.m.
17 ,,	●	New Moon	11 11 p.m.
26 ,,	☾	First Quarter	2 42 a.m.

Perigee, 4th February, at 8.24 a.m.
Apogee, 19th February, at 7.42 a.m.

Possessors of telescopes or binoculars will find it interesting to look for Jupiter near the Moon about 4 or 5 o'clock in the afternoon of the 28th. Jupiter will then be on the southern side of the Moon, at a distance nearly as great as the length of the Southern Cross.

Conjunctions of the Moon with the other planets during this month will occur when they are below the horizon in Queensland.

Mercury will rise at 3.34 a.m. on the 1st and at 3.59 a.m. on the 14th.

Venus will rise at 2.4 a.m. on the 1st and at 2.9 a.m. on the 14th.

Mars will rise at 6.37 p.m. on the 1st and at 5.28 p.m. on the 14th.

Jupiter will rise at 4.56 p.m. on the 1st and at 3.59 p.m. on the 14th.

Saturn will rise at 3.37 a.m. on the 1st and at 2.52 a.m. on the 14th.

The Southern Cross in the early part of February will be at position VIII. about 8 o'clock in the evening. Coming into view in the south-east in a slanting position with its head a good deal inclined downwards.

4 Mar.	○	Full Moon	8 36 p.m.
11 ,,	☽	Last Quarter	3 15 p.m.
19 ,,	●	New Moon	5 50 p.m.
27 ,,	☾	First Quarter	3 4 p.m.

Perigree, 4th March, at 8.42 p.m.
Apogee, 18th March, at 8.48 a.m.

About an hour after sunset on the 1st March it will be interesting to notice that Mars which was in opposition to the Sun on 27th January, will be only about one degree south of the Moon. They will be in the constellation Cancer, with Castor and Pollux to the north-west, the Moon having passed through Gemini a few days earlier.

An occultation of Antares, the principal star of Scorpio, will occur on the 10th instant some time before the Moon rises, about 10.16 p.m. at Warwick and about 11.3 at Hughenden. At these times it will be noticeable that the Moon will be two and three degrees eastward of Antares.

The Moon will pass Saturn on the night of the 13th at a distance equal to the length of the Southern Cross to the northward of the planet.

On the 15th, when on the far side of its orbit and about 130 million miles from the Earth, Mercury will be almost behind the Sun.

The conjunction of Mercury with the New Moon on the 19th will, of course, be invisible.

As the time of our autumnal Equinox will be midnight of the 21st, it will be equally correct to say that the Equinox will be on the 21st or 22nd.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/- including postage.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXV. 1 MARCH, 1931. PART 3.

Event and Comment.

The Current Issue.

FIRST results of farm fertility trials, initiated and carried through successfully last year throughout the sugar districts from Mossman to Nambour, are described fully in this issue by Dr. Kerr. Mr. Edmund Jarvis continues his useful serial notes on cane pest combat and control. A new contributor, Mr. Morwood, has some notes on the American Foul Brood; while the occurrence of a beetle in the stomach of domestic animals is described by Mr. Roberts, who also contributes a note on the Buffalo Fly. Tuberculosis in pigs and how it affects the farmer's pocket is the subject of a timely article, which will be available later in pamphlet form. Mr. Downey describes methods of weighing pigs on the farm, while Mr. Shelton has a note on castration of pigs. Nutrition in sheep is discussed by Messrs. Brünnich and Winks. Butter-making for home consumption is the subject of another useful article. Some interesting information is given by Mr. McGrath on acidity in milk and cream. The progress of fruitgrowing in North Queensland is reported on by Mr. Freeman; and Mr. Barnes has something to say on unproductive citrus trees, followed by an account of fertilizer trials at Elimbah. Regular Journal features are well supplied, and the March issue is sure to meet with a ready welcome from our readers.

Treatment of Smutted Barley.

THE use of smutted barley is not recommended for seed. If it is necessary to use barley showing its presence, smut should be floated and skimmed off after pouring the grain into a vessel containing an ordinary brine solution. Conditions which obtained during the winter and spring of 1930 were favourable for the growths of many kinds of fungus which affect grain, and barley, in common with other winter-growing cereals, suffered in consequence. The Barley Board states that the proportion of smutted grain received generally from growers is unduly high; so badly infected are some of the consignments that, without prior treatment, they are

unsuited even for gristing. In order to correct this state of affairs, and enable growers to produce a food fit for both human and animal consumption, all barley intended for seed should be subjected to treatment by some form of fungicide. That recommended is known as the formalin method, and involves the soaking of all seed barley in a solution consisting of 1 pint of formalin to 60 gallons of water for a period of ten minutes. *Measure the quantities accurately.* The sacks of seed barley should, for convenience in handling, be not more than one-third full, and be securely fastened at the neck. The bags are then totally immersed in the solution and the grain moved freely in the bag whilst in the solution. After ten minutes' immersion each bag is lifted out, and the surplus moisture allowed to drain back into the trough; the grain is then spread out thinly on the ground or floor to dry. If the dipping is done overnight, the seed will be dry enough to sow the next day. It should be remembered that, if it is desired when the seed is dried sufficiently to change it into other bags, the bags so used must also have been treated by the solution to prevent any risk of reinfection.

The Indian Horse Trade.

THE Minister for Agriculture and Stock (Mr. H. F. Walker) has had under consideration the possibilities of a revival of the export trade in horses from Queensland to India. The diversion of this trade to other countries is a matter of concern not only to horse breeders but to farmers in this State, and in furtherance of his desire to secure the support and co-operation of interested parties in this matter, Mr. Walker has convened a conference of representative horse breeders, to be held in Mackay on the twenty-sixth of this month. Invitations have been extended to breeders and owners, and the attendance of all persons who are interested in the proposal to revive this industry would be welcomed.

Veterinary Science—Its Value to Australia.

IN the course of his delivery of the first Kendall oration at Canberra's Institute of Anatomy, Dr. W. R. Robertson (Director of Veterinary Hygiene) said it could not be too strongly emphasised that veterinary science provided one of the first lines of defence in the maintenance of human health. Dr. William Tyson Kendall, shortly after his arrival in Melbourne in 1879, recognised the importance of the live stock industry to Australia, and formed a veterinary association from the few members of the profession then available. In 1888 the veterinary college was formally opened in Brunswick street, Fitzroy, with six students, and in 1908 it was transferred to the University. The value of veterinary science and the necessity of having a competent staff in every State had then become fully recognised. Dr. Kendall's life was given to the education of veterinary surgeons and an endeavour to impress upon the Governments and stockowners generally the dangers of allowing diseases to be introduced to a clean country. In a normal year the value of production from the pastoral and dairy industry in the Commonwealth is approximately £150,000,000. From those figures it will be realised how dangerous would be a spread of live stock diseases. Rinderpest, which gained access to Western Australia in 1923, would have ruined the Australian pastoral industry had it become firmly established. Immediately the disease was discovered every country in the world closed its ports to Australian animals and animal products, and meat export came to a standstill. The disease was eradicated at a cost of approximately £50,000.

Such is the wastage of animal life in Australia, says Dr. Robertson, that it is costing over £150,000 annually to prevent the spread of cattle tick, while the loss to the industry from depreciation is £500,000 a year. Another £500,000 is lost annually from tuberculosis, without taking into account the loss of human life or suffering, to which a monetary value cannot be given. The latest danger is the buffalo fly. It is estimated that the export value of the beef and dairying industry would be reduced by £1,500,000 a year if the pest extended to the southern areas of Queensland and New South Wales. To Dr. Kendall all honour is due for the long and strenuous fight waged in order to establish the veterinary profession in Australia, and to bring home to Governments and the stock-owning public the knowledge that animal health is vitally important, and that the fostering of it is a special study undertaken in the training of the veterinarian.

The Need of a Forest Conscience.—"The Spirits of the Trees."

AUSTRALIANS are commonly reproached by observant visitors with the charge that they have not, as yet, developed a real forest conscience. Any argument to the contrary is immediately met by an invitation to view the landscape from a railway carriage window between any of our capital cities, without going further afield, where enormous tracts of country have, by indiscriminate ringbarking and otherwise, been denuded ruthlessly of valuable indigenous forests. In the course of a recent public address in Melbourne, the Registrar of the Council of Public Education of Victoria, Mr. R. H. Croll, advanced the interesting theory that many Australian farmers and others have inherited a conscious or sub-conscious hatred for trees from their pioneer ancestors, who when they "invaded" Australia were faced with vast armies of trees. To prepare the ground for use they had to attack this enemy with a ruthlessness born of necessity, and now, when such measures are not only unnecessary, but extremely harmful to the country, the same pitiless destruction goes on. Farms are seen standing naked, without a stick of timber to clothe them, and valuable forests are wiped out so as to provide relatively worthless paddocks. Mr. Croll hinted at a terrible vengeance which "the spirits of the trees" might one day exact from man for his violation of nature's laws. He pointed out that green vegetation is necessary to the composition of the very air we breathe, and to the continuance of our water supplies. Without those two necessities we would swiftly perish in a dry and choking atmosphere. In conclusion, Mr. Croll appealed to the public to look after their forests. Ninety per cent. of forest fires, he said, were caused by the carelessness of man.

TO SUBSCRIBERS.

Farmers are urged to retain their names on our mailing list, for through the Journal they may keep themselves well informed in respect of the activities of the Department, and other matters with which they are directly concerned. Instead of sending just the annual subscription along, it is suggested that, when renewing it, they do so for a longer term. For instance, five shillings would keep their names on our subscribers' register for five years. By doing this they would obviously help to reduce clerical labour as well as avoid the inconvenience to themselves of posting annually the very small sum necessary to keep their names on our register.

A cross placed in the square on the first page of the Journal is an indication that the term of subscription ends with the number so marked, and it is advisable to renew immediately if the retention of names on our mailing list is desired.

When ordering the Journal, or renewing a subscription, please write plainly and print surname and Christian names in BLOCK TYPE (example—JOHN HENRY SMITH). Write FULL ADDRESS plainly. Attention to these important details will save time and money.

To farmers, graziers, horticulturists, and Schools of Art the annual subscription—one shilling—is merely nominal, and the charge is only imposed to cover the cost of postage. To them, otherwise, it is an absolutely free issue.

Though back numbers may be supplied, prompt renewals of subscriptions will save the extra cost involved, and in these matters the strictest economy is imperative.

On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Bureau of Sugar Experiment Stations.

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

By EDMUND JARVIS.

CONTROLLING GRUBS OF CANE BEETLES.

During the beginning of February larvæ of our greyback cockchafer will be in the second and third stage of growth. At this stage of development grubs of the former stage can be easily distinguished by the width of head, which measures a quarter of an inch across transversely, while in those of the third stage the head width is three-eighths of an inch. By the end of this month most grubs will have attained their full size, and entered upon their maximum period of destructiveness. Throughout most of February, however, benefit can be obtained on areas where the cane happens to be still small, by stirring the soil at intervals to break up grub chambers, and so give Pheidole ants a chance to assist the farmer in this connection.

Fighting Plant-Eating Beetle Borer.

Small plant-eating beetles belonging to the genus *Rhyparida* may prove injurious this month to young cane shoots. The small white or creamy-yellow grubs of this pest occur in the soil against the basal portion of the stalks, or in the central core of affected shoots, where by devouring the succulent internal tissue they bring about death of the heart-leaves. The beetles, which in the case of two of our species known to attack cane are small hemispherical insects scarcely exceeding a quarter of an inch in length, are of sluggish habit, and often found resting upon the leaves of blady grass and other plants. If touched they usually fall at once to the ground and play possum.

Suitable remedial measures against this insect consist in—

(1) Cutting out all "dead-hearts";

(2) Collecting the beetles when very numerous by shaking them into shallow pans containing water with a film of kerosene;

(3) Keeping headlands free from blady grass; and

(4) Fumigating badly infested soil with carbon bisulphide.

Growers are asked to advise the Entomologist at Meringa of any material injury to cane thought to be due to the presence of this beetle.

Grass Caterpillars Attacking Cane Stools.

Keep a look-out for the so-called "Leaf-eating Grass Worm" which occasionally strips the leaves of cane and maize plants. This caterpillar is dark-brown with three stripes on the back and one on each side pale-yellow, the first body segment being brownish-black with three white stripes. Its head is reddish-brown, with eyes lighter and indistinctly mottled with yellow, and with a large V-shaped mark on face. Under surface of body light yellowish-green dotted with white or brown on the area between legs and lower sides of body. Length of caterpillar 1 inch. The first serious outbreak of this insect occurred at Meringa during February of 1920, when the larvæ were noticed swarming in countless thousands over an area of about 1,000 acres planted to maize and sugar-cane.

In cases where cane is seriously injured, while the caterpillars are only about half grown it is advisable to spray the leaves with lead arsenate (2 lb. in 50 gallons of water). The swarm of advancing caterpillars can be checked by spraying herbage, &c., lying between them and the crop with a solution consisting of arsenic of soda 1. lb., black sugar 2 lb., water 10 gallons. Fortunately, the insect in question is well controlled naturally by various predaceous and parasitic insect enemies, chief of which is a small tachinid fly. (For additional control methods see Bulletin No. 3, Second Edition (revised), pp. 40-42.)

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report for the period December to January, 1930-31, from Mr. E. Jarvis, Entomologist, Meringa, near Cairns:—

CONTROL OF OUR LARGE MOTH BORER OF CANE

(*Phragmatiphila truncata* Walk.).

DAMAGE due to this pest is frequently mistaken for that caused by our beetle borer of cane (*Rhabdocnemis obscurus* Boisd.) which, however, is a dark greyish-black weevil of totally different appearance and habits. The following points of distinction should help growers to distinguish between these two species:—

The moth borer in question generally attacks young plant and ratoon shoots from 1 to 2 feet high, its long slender caterpillar being light yellowish in colour suffused at times with purple; whereas, the grub of the beetle borer is creamy white, of somewhat pear-shaped form, and pointed at the tail end. Owing to the habits and protective coloration of this moth, specimens are very rarely to be met with in canefields. When at rest, with wings wrapped closely above the body, it resembles a fragment of dry stick or a dead twisted leaf, and if handled at such times offers no sign of life, remaining quite motionless and making no attempt to escape by flight.

Description of Moth.

A life sketch of this insect with expanded wings is shown at Fig. 1 on accompanying plate.

The front wings are of uniform light yellowish silvery-brown, with a row of tiny black dots on edge of outer border, an oblique irregular row near centre of wing, and a few dots on basal area of same. Hind wings paler, and without spots. Antennæ of female setaceous; those of male with two rows of pectinations. Pronotum tufted with a cushion of long brownish scales, under which the head is usually hidden from view. Wing expanse variable, from 27 to 36 mm. Specimens of these moths may be easily bred from caterpillars cut out of "dead-hearts."

Description of Pupa.

Shining dark reddish-yellow. Abdomen obscurely banded, with ochreaceous head. End of anal segment and dorsum of thorax blackish-red. Dorsal area of first five body segments with numerous transverse striæ, remaining segments with a few striæ, and the anterior portion coarsely punctulate. Hind angle of front wings close to spiracular line broadly rounded, commencing at posterior edge of sixth body segment; tips of wings reaching nearly to posterior edge of fourth abdominal segment. Pronotum roughly striate and punctate. Spiracles narrowly elongate. Extremity of anal segment furnished with two short horn-like hooks (see Figs. 3 and 6). Length 19 to 23 mm., width 5 mm.

Habits of the Caterpillar.

During 1915, when initial investigations were carried out by the writer in connection with the occurrence of this moth borer in canefields around Gordonvale, it was noticed that a single caterpillar will often destroy many shoots in a stool. (See Fig. 10 on plate.) This habit has been observed also in New South Wales, where *P. truncata* is the principal insect pest of sugar-cane, being very destructive to the young plants and to mature cane sticks.

Such desertion of the young shoots first tunnelled by these caterpillars is probably due to decay of the succulent central core—caused by death of the heart-leaves—which sets up fermentation and internal fetid conditions.

When attacking fully-grown canes the caterpillar will often bore into the softer upper portions of a stick, tunnelling in more or less transverse direction, just under the rind below the cane top and sometimes causing death of the central leaves; or will invade the basal end of sticks as shown at Fig. 9 on plate.

If disturbed it invariably seeks the bottom of its tunnel, making no attempt to vacate it until the shoot or cane be sectioned lengthwise, when it drops hastily to the ground; remaining there motionless if hidden from view, or crawling rapidly away if exposed in search of suitable cover. Transformation to the pupal stage often takes place in a tunnel formed by the larva in such position as to provide the future moth with a suitable exit from the cane; or pupation may occur in the

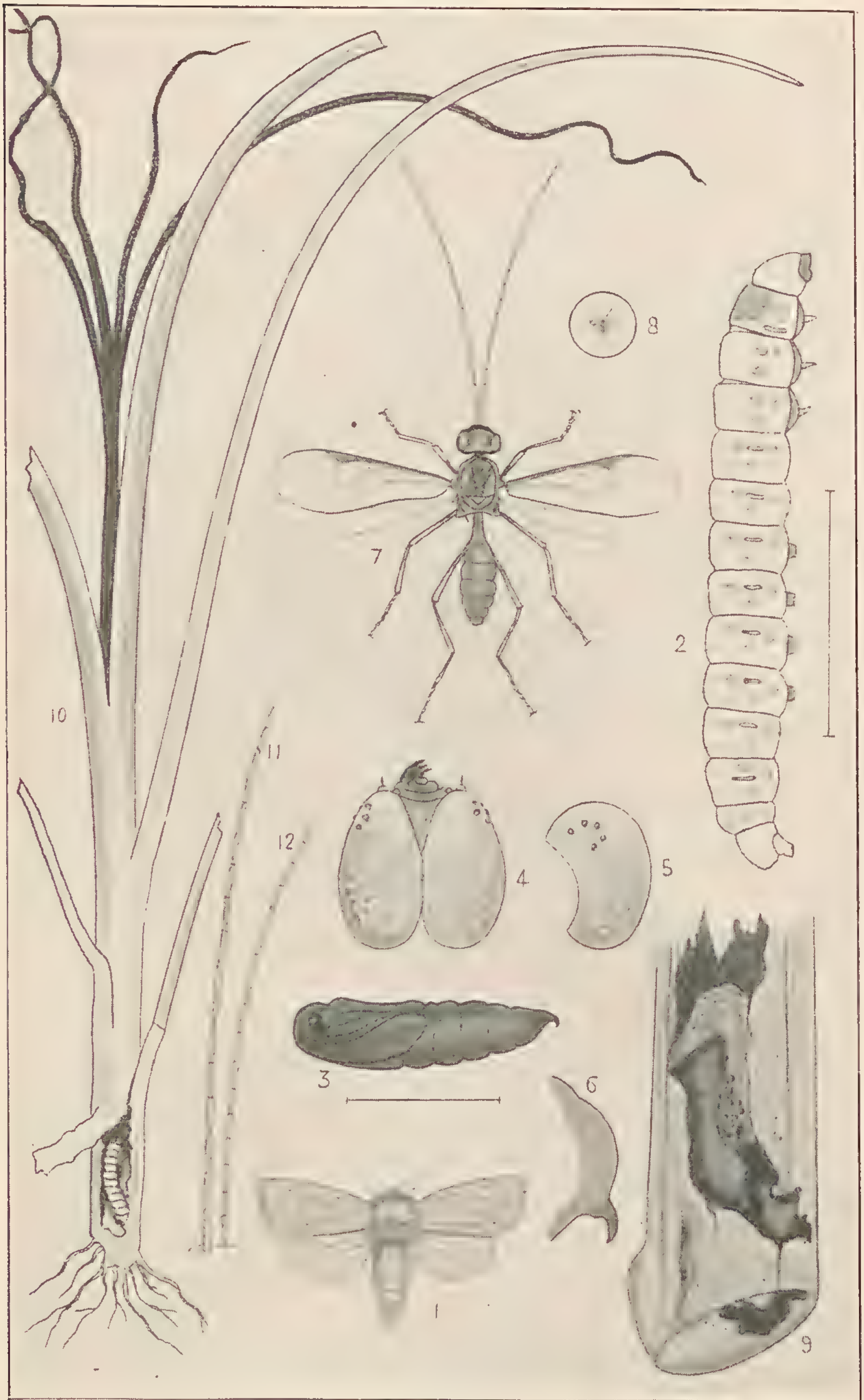


PLATE 55.

(For Description of Plate see page 143.)

centre of young damaged shoots amongst moist excreta, close to the ground against bases of canes, or under dead leaf-sheaths or debris webbed together to afford temporary protection to the pupa.

Description of the Caterpillar.

General colour light purplish or yellowish-pink, paler on ventral area. Sides of body marked with numerous dull brown spots or blotches of variable size and shape. Spiracles large, black, of narrow elongate form. Dorsal surface of first thoracic segment with a coriaceous brownish-yellow plate, the second and third thoracic segments deeply wrinkled. Head castaneous (chestnut colour), median depression well marked, eyes rounded behind, lateral ocelli five in number (Figs. 4 and 5), mandibles blackish, labrum, labium, and maxillæ pinkish. Dorsal area of body-segments 2 to 10 have four black dots, each encircled by a suffused whitish ring; those on thoracic segments being in a transverse line, and on abdominal segments 1 to 8 in two pairs, the anterior closer together than the posterior pair except on segment 8, where they are larger and wider apart anteriorly. Segment 9 has a transverse row of six large smoky blotches close to posterior margin. Ventral area of abdominal segments 1, 2, 7, 8, with a transverse row of six to eight black dots. Anal segment with eight dorsal dull yellow hairs in two transverse rows, and sides of anal claspers surrounded by about the same number, each anal hair being encircled by a tiny black ring. All dots and blotches mark the site of a single short brown hair. Arrangements on each segment of the shining smoky postulate blotches occurring on sides of body are shown in Fig. 2 of plate. Length of caterpillar 25 to 38 mm. (1 to 1½ inch).

Insect Parasites of the Large Moth Borer.

About eleven years ago (November, 1919) while studying the life history of this pest under field conditions, the writer was fortunate enough to breed a braconid parasite from cocoons found in a tunnelled cane shoot, which proved to be *Apanteles nonagriæ* Oliff., an insect previously described by Oliff. in 1893, and which happened to be the chief enemy of *P. truncata* in New South Wales (see Bulletin No. 17, pp. 64, 69, 72). In view of the fact that each of these minute wasp parasites is able to lay nearly 100 eggs (our highest record from specimens bred at Meringa Experiment Station being 93), and, moreover, has a life cycle of only three weeks, it is not surprising that in the Cairns district damage to cane from attacks of this moth borer seldom assume serious proportions. The larval stage of this braconid parasite occupies about fourteen days, after which its maggots leave the body of the infested caterpillar and spin white egg-shaped silken cocoons, which measure about three-sixteenth of an inch in length and are attached together in a mass, either near the empty skin of the host, in some convenient cane tunnel, or behind loosened leaf-sheaths, &c.

LARGE MOTH BORER.

Descriptive notes in connection with illustrations of the "Large Moth Borer" shown in Plate 55, page 142 :—

FIG. 1.—"Large Moth Borer," female, natural size.

FIG. 2—Diagrammatic sketch of caterpillar of same, showing position of smoky blotches, magnified.

FIG. 3.—Pupa of same, magnified.

FIG. 4.—Head of larva of same, magnified.

FIG. 5.—Side view of head of same, showing lateral ocelli.

FIG. 6.—Side view of extremity of anal segment of pupa of same, showing a terminal hook, magnified.

FIG. 7.—Hymenopterous parasite of same (*Apanteles nonagriæ* Oliff.), highly magnified.

FIG. 8.—*Apanteles nonagriæ* Oliff., natural size.

FIG. 9.—Section of basal portion of cane stick, tunnelled by caterpillar of the "large moth borer."

FIG. 10.—Diagrammatic sketch of shoot with "dead-heart."

FIG. 11.—Sketch of antenna of male wasp (*A. nonagriæ*), showing 18 joints, highly magnified.

FIG. 12.—Sketch of 18-jointed antenna of female parasite (*A. nonagriæ*) of same magnification as Fig. 11.

This useful little wasp, which might easily be mistaken at first sight for a very tiny black fly, is about one-twelfth of an inch long, with reddish legs and two thread-like antennæ of greater length than its body. Details of the wing neuration, ocelli, and other specific characters are shown in the magnified sketch given at Fig. 7.

Another important insect enemy of *P. truncata* is a large tachinid fly, which was first bred by the writer from caterpillars collected near Gordonvale in the year 1915 (see Bulletin No. 3, Second Edition (revised), p. 9). As no description of this parasite has been published, the following brief account of its general appearance, when slightly magnified, will be of interest to sugar entomologists:—

Female.—Body very robust, abdomen noticeably wider than thorax, dull blue-grey obscurely blotched with yellow and clothed with very long black bristles. Head wider than thorax; vertex scarcely width of eye; face whitish-ochraceous, with about thirty-two long bristles on upper portion; median depression whitish with a row of small and three long bristles on each side, the latter being near proboscis. Eyes large, dark, castaneous, hind margin bordered dorsally by a narrow silver band edged posteriorly with small black spines; surface of occiput silvery, densely clothed with white hairs. Antennæ reddish-yellow, second joint about twice length of first, third more than three times length of second, flabellate, clouded distally with dark grey, arista naked, obscure reddish, thickened on basal portion; palpi yellow; proboscis blackish; ocelli pink, situated on dark suffusion. Mesonotum bluish grey, clouded sub-dorsally and on hind margin with dull ochraceous, and marked very obscurely with about twelve longitudinal impressed blackish striæ irregularly distributed in two transverse rows; bristles about thirty-six in number, forming six rows. Scutellum large, dull ochraceous, with four very long curved marginal bristles and a number of much shorter ones. Halteres yellow, squamæ large, white, margined with pale yellow. Wing neuration yellow, shaded into fuscous towards tip; costal nervure edged with tiny spines. Length of wing 7.50 mm., width 3.30 mm.; abdomen ochraceous, grey, pollinose, clouded except on sides of second segment with brownish-blue, and thickly set with short spines; hind edge of third segment with about twelve, and apical area of fourth segment with ten long spines. Legs blue-black, femora with many long spines. Length of body 7.50 mm., width across abdomen 4 mm. Wing expanse 17 mm.

Appearance and Mode of Injury.

The presence of this moth borer in canefields is rendered conspicuous owing to the central leaves of affected plants ultimately dying and turning a yellowish-brown colour, exhibiting what is known as "dead-hearts." (See Fig. 10.) Infestation, however, is usually of local occurrence, the plants attacked being more or less scattered, while the entire area affected seldom exceeds much more than an acre. The percentage of loss amongst young ratoon shoots is generally greater, as might be expected, close to headlands than near the centre of a block of cane; indicating that such difference has arisen from an invasion of moths breeding in native food-plants growing outside the cultivation. From field observations made by the writer a single egg is attached to the base of a cane shoot in some secluded position close to the ground. In all probability four broods of this moth occur annually, the one appearing in the spring (September to November) when most of the cane is small, generally doing most damage to young plant and ratoon crops.

Remedial Methods.

At the present time we may reasonably assume that our large moth borer is mainly controlled by the two abovementioned parasites, although quite possibly additional hymenopterous enemies may be found later on to play a part in its biological control. In many canefields around Cairns, Babinda, and other districts a small Pheidole ant affords very material assistance in thinning the ranks of this borer by entering the tunnels in affected shoots and killing the caterpillars.

The artificial control method adopted in most cases of infestation consists in cutting out all shoots showing "dead-hearts"; taking care to sever them at a point about 2½ inches below ground level, in order to ensure getting below the caterpillar. These should be crushed to destroy the enclosed caterpillars or pupæ.

On certain farms at Rita Island in the Burdekin district the larvæ of this moth are credited with effecting considerable damage at times to young cane shoots when only a few inches high. Some of the farmers there assert they have found caterpillars of *P. truncata* breeding outside cane land in a large kind of grass. While such belief is quite feasible and probably correct, no native food-plants have, to my knowledge, been definitely determined or recorded for this species up to the present.

FARM FERTILITY TRIALS.

RESULTS FOR THE 1930 SEASON.

Compiled by H. W. KERR, Agriculturist.

During the past milling season the first series of farm fertility trials was harvested. In all twenty-nine experiments were carried through successfully; these were distributed throughout the cane areas from Mossman to Nambour. The returns from these experiments provide us with some very useful information, and our results must be regarded as quite satisfactory. With the progress of time many of the minor defects from which the earlier trials have suffered will be eliminated, and the quality of the results should be improved as a consequence.

EXPERIMENTAL METHOD.

THE general type of layout for these experiments was a series of twenty-five small plots of equal size varying in area from one-fifteenth to one-twenty-fifth acre depending on expected crop, harvesting method, area of block on which the trial was located, and so on. These plots were set out in five rows of five plots, giving us five plots of each of five treatments. In this way the question of soil variation from point to point in the field could be overcome to a large extent, by scattering the five plots of each treatment at random throughout the block. To make the matter clear we give below a plan of a typical experimental layout:—

N P	C	N P K	N	N K
N P K	N	N P	N K	C
C	N K	N	N P	N P K
N K	N P	C	N P K	N
N	N P K	N K	C	N P

At harvesting, the cane from each plot was taken on one mill truck, and individual weights obtained. As far as possible, individual c.c.s. tests were also secured from the mill samples. In calculating the results from the different treatments, the average weight of cane from each set of five plots was taken as a measure of the true yields for that treatment under the local conditions of soil, climate, and cultivation methods.

Fertilisers Employed.

No commercial mixtures were used in setting out any of the trials. All treatments were based on the use of the three "primary" constituents of a mineral nature which are commonly used in the manufacture of commercial mixed manures, namely:—

(1) Sulphate of ammonia, which supplies 20 per cent. of nitrogen in a water-soluble form.

(2) Superphosphate, which contains 22 per cent. of phosphoric acid in the water-soluble condition.

(3) Muriate of potash, supplying 50 per cent. of water-soluble potash.

Our first series of five plots acted as a control on the manurial treatments, and these received no fertiliser. They are designated in the plan by "C." Another set of five received a fixed amount of sulphate of ammonia as the only fertilising constituent; these plots are marked "N." A further series received superphosphate in addition to the above quantity of sulphate of ammonia; these are the "N P" plots. Other five were treated with potash and sulphate of ammonia, and these are labelled "N K." The remaining five plots received a complete fertiliser—sulphate of ammonia, superphosphate, and muriate of potash; these are represented by "N P K" on the plan.

In each treatment, the letters represent the same weights of fertiliser per acre whenever they appear, thus for a typical example:—

"N" represents 240 lb. sulphate of ammonia,

"P" represents 300 lb. superphosphate,

"K" represents 180 lb. muriate of potash.

It will be evident, then, that by comparing the five average yields after harvesting, the value of the additional constituents over the simple treatments may readily be gauged.

In selecting the above constituents for use in these trials, the question of simplicity was the chief consideration. Further, by selecting water-soluble fertiliser, quick response was sought. Muriate of potash was taken in preference to the sulphate, because of the purchase price consideration. The former is the cheaper per unit of potash, and our experiments to date with these two forms of potash indicate that they are essentially equally efficient as sources of potash for cane growing.

Combination of Fertiliser and Liming Trial.

In a few selected localities, it was found convenient to test the need for lime, in addition to the five treatments enumerated above. With these trials thirty plots were selected, in six sets of five. Thus, there were six plots of each fertiliser treatment and, in addition, three of these were limed whilst three were left unlimed. It will be appreciated that such an experiment yields considerably more information than the simple type without lime, but the question of the lime and fertiliser application and the increase in the number of plots required, make the laying-out and harvesting of the experiment much more laborious.

Method of Application of Fertiliser.

Research work in other countries has shown that the earlier the fertiliser is applied to the crop, the greater is the response to the treatment. Our own experiments have shown identical results. Consequently, in these farm trials, all potash and superphosphate was applied in the drill before the plants were dropped. With the sulphate of ammonia the case is somewhat different. Water-soluble nitrogenous fertilisers are likely to do damage to young roots and shoots under certain conditions. Further, under conditions of heavy rainfall, the valuable nitrates may be washed from the soil before the crop can absorb them; this danger does not arise in the case of superphosphate and potash. Hence, only about one-fifth to one-fourth of the ammonia was applied in the drill, while the remainder was given as a top-dressing when the stools were fairly well established. It was generally possible to have the fertilising completed by the end of November.

Many growers will doubtless take exception to this method of applying fertiliser, but we can assure them that we have every reason to believe that it is the best practice. In no case have we observed ill effects from fertiliser applied in this way, and in many instances, particularly where soils are deficient in phosphates, we have observed that any plots receiving superphosphate in the drill have made decidedly better earlier growth than those which received none, and this advantage was maintained throughout the growing period.

Results to Date.

A note of warning should be given in presenting the results of one year's work. It must be carefully observed that these responses to fertiliser are governed by a number of factors, one of which is climate. Under a certain rainfall distribution one fertiliser combination may prove superior, while in another year the returns will be quite different. It should be borne in mind, then, that the results reported herewith cover only one particular season and are to be taken only as indicative of what might be expected. Most of the plots reported will be carried through two ratoon crops in addition to the plant, and in this way we hope to make the data more nearly complete.

On the whole, the past season was not a good one for cane growth; the spring was decidedly dry, and the rainfall distribution during the summer months was not good. Favourable conditions during the autumn months did assist materially, and the late-harvested cane benefited accordingly.

Basis for Calculation of Value of Crop Returns.

As it is not possible at this time to determine the final nett price to be paid for the past season's crop, the declared price of £17 16s. 10d. per ton raw sugar has been taken as the basis for calculation. Fertiliser prices are based on the Brisbane quotations plus freight. An allowance of 10s. per acre has been made for the cost of application of the fertiliser.

NORTHERN DIVISION.

Location.—**Pringle Brothers' farm, Mossman.**

Soil Type.—Recent alluvial soil on the Mossman River.

Variety.—Badila. Age of crop—Fifteen months.

RESULTS.

——	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 200 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 200 lb. Potash.
Tons cane per acre	26·4	30·5	31·7	33·0	32·6
C.C.S. in cane	18·2%	18·0%	17·9%	17·9%	17·7%
Value of crop	£61 16 0	£69 8 0	£71 17 0	£73 19 0	£72 16 0
Less harvesting costs	£10 10 0	£12 4 0	£12 18 0	£13 4 0	£13 1 0
Return	£51 6 0	£57 4 0	£58 19 0	£60 15 0	£59 15 0
Increased return due to fertiliser	..	£5 18 0	£7 13 0	£9 9 0	£8 9 0
Cost of fertiliser and application	..	£2 12 0	£3 16 0	£4 0 0	£5 4 0
Profit from fertiliser	..	£3 6 0	£3 17 0	£5 9 0	£3 5 0

Discussion.—It will be seen that there was a good response to sulphate of ammonia and potash, with but little, if any, from super. The best return was shown from the mixture of sulphate of ammonia and potash—£5 9s. profit per acre. Even the application of 800 lb. of fertiliser per acre, in the complete mixture, showed a profit of 63 per cent. on the money invested for the fertiliser.

Location.—**L. R. Hearn's farm, Mossman.**

Soil Type.—Alluvial soil on the Mossman River. Soil tests showed that the land needed liming.

Variety.—Badila. Age of cane— Fifteen months.

Experimental Plan.—Thirty small plots were set out—fifteen received 1 ton per acre of burnt lime before planting, the remaining fifteen received no lime.

Six plots were given each of the following treatments—three of these had been limed and three left unlimed:—

RESULTS.

——	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Superphosphate.	300 lb. Sulphate of Ammonia + 200 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Superphosphate + 200 lb. Potash.
Tons cane per acre	26·0	30·6	29·4	30·3	31·9
C.C.S. in cane	17·3%	16·8%	16·4%	16·6%	16·7%

RESULTS FROM LIME.

No lime plots	27·9 tons cane per acre
One ton burnt lime	31·4 tons cane per acre
Increased yield	3·5 tons cane per acre.

Discussion.—The results from this experiment are somewhat erratic, and it is not possible to draw definite conclusions. It is to be hoped that the ratoon crop yields will give more consistent results.

The crop suffered severely for want of moisture in the spring, yet we find a definite increase from sulphate of ammonia and lime. The increase from lime should be of interest to growers in the Mossman area. Probably results from the use of the Mowbray crushed limestone will not be as pronounced as the above on the plant crop following the application; for we know that burnt lime is much quicker in its action than crushed limestone. However, it is probable that the total return over a series of crops will compare very favourably, and the crushed limestone should be the cheaper form of lime in this area.

Location.—**A. J. Kelly's farm, Aloomba.**

Soil Type.—Old alluvial soil of the Mulgrave River; land typical of much of the Aloomba country.

Variety.—B. 147. Age of crop—Thirteen and a-half months.

CROP RESULTS.

——	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Superphosphate.	300 lb. Sulphate of Ammonia + 200 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Superphosphate + 200 lb. Potash.
Tons cane per acre	28·2	30·8	33·5	31·9	33·7
C.C.S. in cane	14·1%	13·3%	13·5%	13·6%	13·5%
Value of crop	£55 2 0	£56 18 0	£62 15 0	£60 3 0	£63 2 0
Less harvesting costs	£11 5 0	£12 7 0	£13 8 0	£12 15 0	£13 10 0
Return	£43 17 0	£44 11 0	£49 7 0	£47 8 0	£49 12 0
Increased return due to fertiliser	..	£0 14 0	£5 10 0	£3 11 0	£5 15 0
Cost of fertiliser and application	..	£2 9 0	£3 10 0	£3 15 0	£4 16 0
Profit or loss from fertiliser ..	..	Loss. £1 15 0	Profit. £2 0 0	Loss. £0 4 0	Profit. £0 19 0

Discussion.—The best return in this experiment was from the use of superphosphate. Although sulphate of ammonia gave a crop increase, the reduction in c.c.s. of the cane made the treatment unprofitable. (This crop was harvested early and was probably not mature.) There appears to be a need for only light dressings of potash on land of this type.

Location.—**R. Matthews's farm, Pawngilly.**

Soil Type.—Alluvial soil, typical of much of the Russell River lands. Tests showed the soil to be very acid and in need of a heavy lime dressing.

Variety.—Badila. Age of cane—Twelve and a-half months.

RESULTS.

—	No Fertiliser.	240 lb. Sulphate of Ammonia.	240 lb. Sulphate of Ammonia + 400 lb. Superphosphate	240 lb. Sulphate of Ammonia + 120 lb. Potash.	240 lb. Sulphate of Ammonia + 400 lb. Superphosphate + 120 lb. Potash.
Tons cane per acre	12·1	12·8	19·2	15·6	20·5
Value of crop	£24 5 0	£25 11 0	£38 6 0	£31 5 0	£41 0 0
Less harvesting costs	£4 17 0	£5 2 0	£7 13 0	£6 5 0	£8 4 0
Return	£19 8 0	£20 9 0	£30 13 0	£25 0 0	£32 16 0
Increased return due to fertiliser	..	£1 1 0	£11 5 0	£5 12 0	£13 8 0
Cost of fertiliser and application	..	£2 1 0	£3 9 0	£2 17 0	£4 5 0
Profit or loss from fertiliser ..	..	Loss. £1 0 0	Profit. £7 16 0	Profit. £2 15 0	Profit. £9 3 0

INCREASED YIELD DUE TO LIME.

No lime	13·0	tons cane per acre.
One and a-half tons burnt lime per acre	18·7	tons cane per acre.
Increase	5·7	tons cane per acre.

Discussion.—The block selected for this experiment was portion of a farm which had been cropped without the use of the correct fertiliser. The land was also very much in need of lime. A thirty-plot trial was set out—fifteen plots received lime before planting and the remaining fifteen were left unlimed.

Series of six plots (three limed and three unlimed) were then submitted to the five fertiliser treatments shown above. The results show that the return from lime and superphosphate has been most marked. This is in conformity with our findings at the South Johnstone Sugar Experiment Station, that very acid soils give best results after the use of lime and superphosphate. The returns may be summarised as follows:—Lime showed an increase of 5¾ tons of cane per acre, and superphosphate (400 lb. per acre) a further 6½ tons.

Location.—**W. Thiele's farm, Pawngilly.**

Soil Type.—The selected block was on the fringe of the red volcanic loam which constitutes a fair area of the elevated cane lands of the Bartle Frere district.

Variety.—Badila. Age of cane—Eighteen months.

CROP RESULTS.

—	No. Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Superphosphate.	300 lb. Sulphate of Ammonia + 300 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Superphosphate + 300 lb. Potash.
Tons cane per acre	18·2	18·9	18·7	30·0	32·3
C.C.S. in cane	13·7%	13·7%	13·5%	14·9%	14·8%
Value of crop	£28 7 0	£29 11 0	£28 15 0	£53 8 0	£57 1 0
Less harvesting costs	£7 5 0	£7 10 0	£7 9 0	£12 0 0	£12 18 0
Return	£21 2 0	£22 1 0	£21 6 0	£41 8 0	£44 3 0
Increased return due to fertiliser	..	£0 19 0	£0 4 0	£20 6 0	£23 1 0
Cost of fertiliser and application	..	£2 9 0	£3 10 0	£4 8 0	£5 9 0
Profit or loss from fertiliser ..	..	Loss. £1 10 0	Loss. £3 6 0	Profit. £15 18 0	Profit. £17 12 0

Discussion.—The outstanding feature of this experiment is the response to potash. The use of this material showed a very large profit, while decided losses were incurred where it was not applied. It should be pointed out that the piece of land carried what are known as "sterile patches" where the cane growth was very poor. It was obvious that wherever potash was applied, the patches ceased to exist.

Remember.—This result applies to the red volcanic loam, and not to alluvial soils; with similar sterile patches under the latter conditions, it is generally found that lime and superphosphate are the corrective materials to apply.

Location.—**J. P. McGowan's farm, Daradgee.**

Soil Type.—The soil was typical of much of the older alluvial soil of the Johnstone River.

Variety.—Badila. Age of crop—Sixteen months.

CROP RESULTS.

—	No Fertiliser.	240 lb. Sulphate of Ammonia.	240 lb. Sulphate of Ammonia + 360 lb. Superphosphate.	240 lb. Sulphate of Ammonia + 160 lb. Potash.	240 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 160 lb. Potash.
Tons cane per acre	33·1	33·4	34·8	34·6	35·8
Value of crop	£59 13 0	£60 2 0	£62 14 0	£62 5 0	£64 10 0
Less harvesting costs	£13 6 0	£13 8 0	£13 18 0	£13 16 0	£14 6 0
Return	£46 7 0	£46 14 0	£48 16 0	£48 9 0	£50 4 0
Increased return from fertiliser ..	..	£0 7 0	£2 9 0	£2 2 0	£3 17 0
Cost of fertiliser and application	..	£2 1 0	£3 6 0	£3 2 0	£4 7 0
Loss from fertiliser	..	£1 14 0	£0 17 0	£1 0 0	£0 10 0

Discussion.—Prior to planting, a leguminous crop which had been fertilised with potash and super. was ploughed under. The above fertilisers were additional, and the results show that under these conditions only small though definite gains in crop yield result. The

leguminous crop had supplied sufficient nitrogen for the plant crop, so that the sulphate of ammonia showed a direct loss. Without this material, the potash and phosphate would probably have shown small profits, and the indications are that a small dressing of these two materials in the drill would have been beneficial.

Location.—**J. A. Wolff's farm, South Johnstone.**

Soil Type.—The red soil of the area which is often confused with the red volcanic loam. It is a soil derived from the decomposition of the schist rock so common in the area.

Variety.—Badila. Age of crop— Fifteen months.

CROP RESULTS.

—	No. Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 240 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	30·8	29·0	37·7	35·1	37·4
Value of crop	£60 7 0	£56 16 0	£73 18 0	£68 16 0	£73 8 0
Less harvesting costs	£12 6 0	£11 12 0	£15 1 0	£14 0 0	£14 19 0
Return	£48 1 0	£45 4 0	£58 17 0	£54 16 0	£58 9 0
Increased return from fertiliser ..	..	Decrease. £2 17 0	£10 16 0	£6 15 0	£10 8 0
Cost of fertiliser and application	..	£2 9 0	£3 10 0	£4 0 0	£5 1 0
Profit or loss from fertiliser ..	..	Loss. £5 6 0	Profit. £7 6 0	Profit. £2 15 0	Profit. £5 7 0

Discussion.—It will be noted that the results are erratic, but there is undoubtedly a good response to potash and superphosphate. The depressed yield due to sulphate of ammonia is, no doubt, fictitious. It is hoped that the returns from the ratoon crop will be more consistent.

Location.—**M. Caldera's farm, Mourilyan.**

Soil Type.—The typical reddish schist soil which forms one of the major soil types of the Mourilyan area.

Variety.—Badila. Age of crop—Seventeen months.

CROP RESULTS.

—	No Fertiliser.	240 lb. Sulphate of Ammonia.	240 lb. Sulphate of Ammonia + 320 lb. Super-phosphate.	240 lb. Sulphate of Ammonia + 200 lb. Potash.	240 lb. Sulphate of Ammonia + 320 lb. Super-phosphate + 200 lb. Potash.
Tons cane per acre	26·8	30·7	32·7	35·7	37·5
C.C.S. in cane	16·5%	16·6%	16·6%	16·6%	16·7%
Value of crop	£55 6 0	£63 17 0	£68 3 0	£74 7 0	£78 18 0
Less harvesting costs	£10 14 0	£12 5 0	£13 2 0	£14 6 0	£15 0 0
Return	£44 12 0	£51 12 0	£55 1 0	£60 1 0	£63 18 0
Increased return from fertiliser ..	..	£7 0 0	£10 9 0	£15 9 0	£19 6 0
Cost of fertiliser and application	..	£2 1 0	£3 3 0	£3 7 0	£4 9 0
Profit from fertiliser	..	£4 19 0	£7 6 0	£12 2 0	£14 17 0

Discussion.—The results from fertiliser have been most marked on this block. Sulphate of ammonia and potash have shown large increases,

with a smaller return from superphosphate. The profit from the use of 760 lb. of mixed fertiliser was almost £15 per acre.

Location.—**S. Pagano's farm, Mourilyan.**

Soil Type.—The typical reddish schist soil of the Mourilyan area.

Variety.—Badila. Age of crop—Twelve and a-half months.

CROP RESULTS.

—	No Fertiliser.	320 lb. Sulphate of Ammonia.	320 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	320 lb. Sulphate of Ammonia + 200 lb. Potash.	320 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 200 lb. Potash.
Tons cane per acre	26·2	28·1	26·7	29·8	29·2
C.C.S. in cane	16·3%	16·0%	16·1%	15·7%	16·0%

Discussion.—This crop followed a "plough-out and replant." There has been some response to the fertiliser treatment, but the results are erratic, and have not been calculated in detail. The plots have been ratooned and better results are hoped for in succeeding crops.

Location.—**W. Jones's farm, Silkwood.**

Soil Type.—Acid alluvial soil typical of the area. Tests show need for lime and phosphate.

Variety.—Badila. Age of crop—Seventeen months.

CROP RESULTS.

—	No Fertiliser.	360 lb. Sulphate of Ammonia.	360 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	360 lb. Sulphate of Ammonia + 180 lb. Potash.	360 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 180 lb. Potash.
Tons cane per acre	21·2	23·1	31·1	23·4	33·5
Value of crop	£35 1 0	£38 4 0	£51 7 0	£38 12 0	£55 5 0
Less harvesting costs	£8 10 0	£9 5 0	£12 9 0	£9 7 0	£13 8 0
Return	£26 11 0	£28 19 0	£38 18 0	£29 5 0	£41 17 0
Increased return from fertiliser ..	..	£2 8 0	£12 7 0	£2 14 0	£15 6 0
Cost of fertiliser and application	..	£2 17 0	£3 18 0	£4 0 0	£5 1 0
Profit or loss from fertiliser ..	..	Loss. £0 9 0	Profit. £8 9 0	Loss. £1 6 0	Profit. £10 5 0

Discussion.—The land was treated to an application of lime earth before planting. The results show a very decided response to superphosphate, which is in harmony with our findings for acid soils of an alluvial nature.

Location.—**Allison Brothers' farm, Midgenoo, Tully.**

Soil Type.—A light buff alluvial soil with tendency towards poor drainage in local areas—typical of a fair area of land in this district.

Variety.—Badila. Age of crop—Fourteen and a-half months.

CROP RESULTS.

—	No Fertiliser.	240 lb. Sulphate of Ammonia.	240 lb. Sulphate of Ammonia + 360 lb. Superphosphate.	240 lb. Sulphate of Ammonia + 150 lb. Potash.	240 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 150 lb. Potash.
Tons cane per acre	19·1	19·7	29·2	21·4	29·1
Value of crop	£34 8 0	£35 7 0	£52 11 0	£38 9 0	£52 8 0
Less harvesting costs	£7 13 0	£7 17 0	£11 14 0	£8 11 0	£11 13 0
Return	£26 15 0	£27 10 0	£40 17 0	£29 18 0	£40 15 0
Increased return from fertiliser	..	£0 15 0	£14 2 0	£3 3 0	£14 0 0
Cost of fertiliser and application	..	£2 1 0	£3 6 0	£3 1 0	£4 6 0
Profit or loss from fertiliser	..	Loss. £1 6 0	Profit. £10 16 0	Profit. £0 2 0	Profit. £9 14 0

Discussion.—One-half of the plots of this experiment received lime earth before planting, the remainder received no lime. The results from liming showed:—

No lime	22·8 tons cane per acre.
Lime earth	24·5 tons cane per acre.
Increase	1·7 tons cane per acre.

The small increase from lime is in keeping with what is generally found to be the case. The plant crop shows a smaller increase than is the case where burnt lime is used, but larger returns can be expected from the ratoon crops.

Again the marked response to phosphate on the acid alluvial soils is noted, and a highly profitable return resulted.

Location.—**S. J. French's farm, Midgenoo, Tully.**

Soil Type.—The typical gravelly loam of the area.

Variety.—Badila. Age of crop—Eleven months (first ratoon).

CROP RETURNS.

—	No. Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Superphosphate.	300 lb. Sulphate of Ammonia + 120 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Superphosphate + 120 lb. Potash.
Tons cane per acre	28·2	31·6	32·5	31·7	32·8
C.C.S. in cane	15·3%	15·1%	14·9%	15·2%	15·1%
Value of crop	£52 6 0	£57 19 0	£58 10 0	£58 9 0	£59 17 0
Less harvesting costs	£11 5 0	£12 12 0	£13 0 0	£12 13 0	£13 2 0
Return	£41 1 0	£45 7 0	£45 10 0	£45 16 0	£46 15 0
Increased return due to fertiliser	..	£4 6 0	£4 9 0	£4 15 0	£5 14 0
Cost of fertiliser and application	..	£2 9 0	£3 10 0	£3 5 0	£4 6 0
Profit from fertiliser	..	£1 17 0	£0 19 0	£1 10 0	£1 8 0

Discussion.—This was a first ratoon crop, and greater response was expected. The return from sulphate of ammonia is appreciable, but potash and super. show only slight gains. It is apparent that these gravelly soils still carry a fair supply of available plant foods.

CENTRAL DIVISION.

Location.—**J. Trevaskis's farm, Farleigh.**

Soil Type.—Sandy loam on gentle slope—similar to a fair area of land in the near neighbourhood.

Variety.—M. 1900. Age of crop—Eighteen months.

RESULTS.

—	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 240 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	15·2	16·0	17·9	18·2	21·2
C.C.S. in cane	18·0%	17·9%	18·2%	18·0%	18·1%
Value of crop	£35 1 0	£36 8 0	£41 15 0	£41 19 0	£49 0 0
Less harvesting costs	£6 2 0	£6 8 0	£7 3 0	£7 6 0	£8 9 0
Return	£28 19 0	£30 0 0	£34 12 0	£34 13 0	£40 11 0
Increased return due to fertiliser	..	£1 1 0	£5 13 0	£5 14 0	£11 12 0
Cost of fertiliser and application	..	£2 8 0	£3 8 0	£3 19 0	£4 18 0
Profit or loss from fertiliser ..	..	Loss. £1 7 0	Profit. £2 5 0	Profit. £1 15 0	Profit. £6 14 0

Discussion.—The results indicate that land of this type requires heavy dressings of a balanced mixture. The heaviest dressing (840 lb. per acre) showed a profit of £6 14s. per acre. The apparently poor response to sulphate of ammonia alone is probably due to the deficiency of phosphate and potash, so that the nitrogenous fertiliser alone showed a loss.

Location.—**H. Single's farm, Foulden, Mackay.**

Soil Type.—Recent alluvial sandy loam of good natural fertility, as found along the banks of the Pioneer River.

Variety.—Q. 813. Age of crop—Eighteen months.

RESULTS.

—	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 240 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	31·5	34·6	33·7	36·4	35·9
C.C.S. in cane	17·2%	16·6%	16·8%	16·6%	16·7%
Value of crop	£68 2 0	£71 16 0	£70 18 0	£75 11 0	£74 19 0
Less harvesting costs	£12 12 0	£13 17 0	£13 10 0	£14 11 0	£14 7 0
Return	£55 10 0	£57 19 0	£57 8 0	£61 0 0	£60 12 0
Increased return due to fertiliser	..	£2 9 0	£1 18 0	£5 10 0	£5 2 0
Cost of fertiliser and application	..	£2 8 0	£3 8 0	£3 19 0	£4 18 0
Profit or loss from fertiliser ..	..	Profit. £0 1 0	Loss. £1 10 0	Profit. £1 11 0	Profit. £0 4 0

Discussion.—The results from the experiment were somewhat erratic, and definite conclusions cannot be drawn. There does appear to

be a definite response to fertiliser, but apparently the heavy dressings were excessive on this type of soil.

Location.—**C. Rowe's farm, Mirani.**

Soil Type.—The better type of well-drained alluvial loam found along the Pioneer Valley.

Variety.—H.Q. 426. Age of crop—Fourteen months.

RESULTS.

—	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 240 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	17·7	21·7	22·7	22·3	24·0
C.C.S. in cane	15·8%	16·0%	15·7%	15·8%	16·1%
Value of crop	£34 12 0	£43 1 0	£44 1 0	£43 11 0	£48 0 0
Less harvesting costs	£7 2 0	£8 13 0	£9 2 0	£8 19 0	£9 12 0
Return	£27 10 0	£34 8 0	£34 19 0	£34 12 0	£38 8 0
Increased return due to fertiliser	..	£6 18 0	£7 9 0	£7 2 0	£10 18 0
Cost of fertiliser and application	..	£2 8 0	£3 8 0	£3 19 0	£4 18 0
Profit from fertiliser	..	£4 10 0	£4 1 0	£3 3 0	£6 0 0

Discussion.—A good response to fertiliser was obtained, and it appears that nitrogenous fertiliser gave the greatest increase. However, 840 lb. of complete mixture showed £6 per acre profit.

Location.—**C. W. Walz's farm, Marian.**

Soil Type.—The soil of this block resembles closely much of the lighter coloured soil of the Mackay area, where natural drainage is only moderately good.

Variety.—M. 1900. Age of crop—Fifteen months.

RESULTS.

—	No Fertiliser.	400 lb. Sulphate of Ammonia.	400 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	400 lb. Sulphate of Ammonia + 240 lb. Potash.	400 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	14·5	17·1	19·4	19·7	20·6
C.C.S. in cane	16·1%	16·5%	16·2%	16·2%	16·2%
Value of crop	£29 0 0	£35 8 0	£39 1 0	£39 13 0	£41 19 0
Less harvesting costs	£5 16 0	£6 17 0	£7 15 0	£7 18 0	£8 5 0
Return	£23 4 0	£28 11 0	£31 6 0	£31 15 0	£33 14 0
Increased return due to fertiliser	..	£5 7 0	£8 2 0	£8 11 0	£10 10 0
Cost of fertiliser and application	..	£3 1 0	£4 0 0	£4 11 0	£5 10 0
Profit from fertiliser	..	£2 6 0	£4 2 0	£4 0 0	£5 0 0

Discussion.—The response to the three fertiliser constituents on this block was fairly even, indicating the need for an evenly balanced mixture. The heaviest dressing (940 lb. per acre) showed a profit of £5 per acre.

Location.—**E. K. Glen's farm, Pleystowe.**

Soil Type.—The soil is typical of the average alluvial soil found in the Pioneer Valley.

Variety.—Q. 813. Age of crop—Thirteen months.

RESULTS.

—	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 240 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 180 lb. Potash.	300 lb. Sulphate of Ammonia + 240 lb. Super-phosphate + 180 lb. Potash.
Tons cane per acre	15·3	17·6	18·5	18·5	19·1
C.C.S. in cane	15·8%	15·7%	15·9%	15·7%	15·7%
Value of crop	£29 19 0	£34 3 0	£36 11 0	£35 18 0	£37 2 0
Less harvesting costs	£6 2 0	£7 1 0	£7 8 0	£7 8 0	£7 13 0
Return	£23 17 0	£27 2 0	£29 3 0	£28 10 0	£29 9 0
Increased return due to fertiliser	..	£3 5 0	£5 6 0	£4 13 0	£5 12 0
Cost of fertiliser and application	..	£2 8 0	£3 4 0	£3 11 0	£4 7 0
Profit from fertiliser	..	£0 17 0	£2 2 0	£1 2 0	£1 5 0

Discussion.—This farm was unfortunate in missing the spring storms which favoured other parts of the district, and the returns are what one might expect from a dry season. However, the return from fertiliser, though small, has been profitable.

Location.—**J. Gibson's farm, Racecourse.**

Soil Type.—The soil was typical of the older soils of the valley, requiring provision for artificial drainage in the wet season.

Variety.—H.Q. 426. Age of crop—Seventeen months.

RESULTS.

—	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 240 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	22·5	24·8	26·4	25·9	24·0
C.C.S. in cane	17·1%	17·6%	17·6%	17·4%	17·5%
Value of crop	£47 15 0	£54 11 0	£57 19 0	£56 1 0	£52 14 0
Less harvesting costs	£9 0 0	£9 19 0	£10 11 0	£10 7 0	£9 12 0
Return	£38 15 0	£44 12 0	£47 8 0	£45 14 0	£43 2 0
Increased return due to fertiliser	..	£5 17 0	£8 13 0	£6 19 0	£4 7 0
Cost of fertiliser and application	..	£2 8 0	£3 8 0	£3 19 0	£4 18 0
Profit or loss from fertiliser	..	Profit. £3 9 0	Profit. £5 5 0	Profit. £3 0 0	Loss. £0 11 0

Discussion.—Unfortunately these results are erratic, probably due to an adverse condition affecting two of the plots of the complete fertiliser. It would appear, however, that definite response to the treatments has been obtained.

Location.—**H. R. Swanson's farm, Homebush.**

Soil Type.—Soil typical of the sandy loam of the Homebush area, responding to artificial drainage by planting in beds.

Variety.—Q. 813. Age of crop—Fifteen months.

RESULTS.

—	No. Fertiliser.	228 lb. Sulphate of Ammonia.	228 lb. Sulphate of Ammonia + 228 lb. Super-phosphate.	228 lb. Sulphate of Ammonia + 136 lb. Potash.	228 lb. Sulphate of Ammonia + 228 lb. Super-phosphate + 136 lb. Potash.
Tons cane per acre	21·8	24·5	26·4	25·3	28·2
C.C.S. in cane	17·3%	17·2%	17·2%	17·3%	17·1%
Value of crop	£47 8 0	£53 0 0	£57 2 0	£55 1 0	£60 13 0
Less harvesting costs	£8 14 0	£9 16 0	£10 11 0	£10 2 0	£11 6 0
Return	£38 14 0	£43 4 0	£46 11 0	£44 19 0	£49 7 0
Increased return due to fertiliser	..	£4 10 0	£7 17 0	£6 5 0	£10 13 0
Cost of fertiliser and application	..	£1 19 0	£2 14 0	£2 16 0	£3 11 0
Profit from fertiliser	..	£2 11 0	£5 3 0	£3 9 0	£7 2 0

Discussion.—Very good response was obtained on this block. This area was favoured by an early thunder storm, which emphasises the importance of the spring rain both in crop growth and results from fertilisers.

Location.—**H. Ivers' farm, Rosella.**

Soil Type.—Sandy loam similar to much of the Homebush land. Artificial surface drainage has been provided for on this farm.

Variety.—Q. 813. Age of crop—Thirteen and a-half months.

RESULTS.

—	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 240 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 180 lb. Potash.	300 lb. Sulphate of Ammonia + 240 lb. Super-phosphate + 180 lb. Potash.
Tons cane per acre	18·7	19·7	25·6	20·9	26·7
C.C.S. in cane	16·7%	16·6%	16·7%	16·7%	16·8%
Value of crop	£39 1 0	£40 18 0	£53 9 0	£43 13 0	£56 4 0
Less harvesting costs	£7 10 0	£7 18 0	£10 5 0	£8 7 0	£10 14 0
Return	£31 11 0	£33 0 0	£43 4 0	£35 6 0	£45 10 0
Increased return due to fertiliser	..	£1 9 0	£11 13 0	£3 15 0	£13 19 0
Cost of fertiliser and application	..	£2 8 0	£3 4 0	£3 11 0	£4 7 0
Profit or loss from fertiliser ..	..	Loss. £0 19 0	Profit. £8 9 0	Profit. £0 4 0	Profit. £9 12 0

Discussion.—The response to phosphates was most marked on this experimental area. The apparent loss from the sulphate of ammonia alone is probably fictitious, due to the fact that in the absence of phosphate, the crop makes but poor use of the nitrogenous manure.

Location.—**P. Petersen's farm, Sarina.**

Soil Type.—Gray sandy loam to clay loam, 14 to 20 inches deep, with general clayey or gravelly clay subsoil.

Variety.—Q. 813. Age of crop—Fifteen months.

RESULTS.

—	No Fertiliser.	320 lb. Sulphate of Ammonia.	320 lb. Sulphate of Ammonia + 240 lb. Superphosphate.	320 lb. Sulphate of Ammonia + 160 lb. Potash.	320 lb. Sulphate of Ammonia + 240 lb. Superphosphate + 160 lb. Potash.
Tons cane per acre	20·1	21·8	23·2	30·0	31·1
C.C.S. in cane	16·9%	16·8%	16·8%	17·0%	17·0%
Value of crop	£42 12 0	£45 17 0	£48 16 0	£64 0 0	£66 7 0
Less harvesting costs	£8 1 0	£8 14 0	£9 6 0	£12 0 0	£12 9 0
Return	£34 11 0	£37 3 0	£39 10 0	£52 0 0	£53 18 0
Increased return due to fertiliser	..	£2 12 0	£4 19 0	£17 9 0	£19 7 0
Cost of fertiliser and application	..	£2 11 0	£3 6 0	£3 11 0	£4 6 0
Profit from fertiliser	..	£0 1 0	£1 13 0	£13 18 0	£15 1 0

Discussion.—On this soil, potash was the important limiting factor, an application of 160 lb. of this material (cost about £1) resulted in about 8 tons increase per acre. Here again the nitrogen showed little increase in the absence of potash, but probably was of material importance in effecting the high yield from the complete manure.

Location.—**P. Brooks's farm, Sarina.**

Soil Type.—Heavy loam soil 10 to 15 inches deep, with stiff clayey subsoil.

Variety.—M. 1900. Age of crop—Thirteen months.

RESULTS.

—	No. Fertiliser.	320 lb. Sulphate of Ammonia.	320 lb. Sulphate of Ammonia + 320 lb. Superphosphate.	320 lb. Sulphate of Ammonia + 160 lb. Potash.	320 lb. Sulphate of Ammonia + 320 lb. Superphosphate + 160 lb. Potash.
Tons cane per acre	19·1	19·5	32·1	21·2	30·7
C.C.S. in cane	15·6%	15·3%	15·2%	15·1%	15·2%
Value of crop	£36 10 0	£36 8 0	£59 8 0	£38 19 0	£56 16 0
Less harvesting costs	£7 13 0	£7 16 0	£12 17 0	£8 10 0	£12 6 0
Return	£28 17 0	£28 12 0	£46 11 0	£30 9 0	£44 10 0
Increased return due to fertiliser	..	Decrease. £0 5 0	£17 14 0	£1 12 0	£15 13 0
Cost of fertiliser and application	..	£2 11 0	£3 12 0	£3 11 0	£4 12 0
Profit or loss from fertiliser ..	..	Loss. £2 16 0	Profit. £14 2 0	Loss. £1 19 0	Profit. £11 1 0

Discussion.—Due to some soil variation effect, the complete fertiliser yield was lower than that from the superphosphate and sulphate of ammonia. However, the results indicate clearly the absolute necessity for heavy phosphate dressings on soils of this type. With treatments which excluded phosphate, the loss from fertiliser was very marked—with the application of super. very high gains resulted.

SOUTHERN DIVISION.

Location.—**Burrage Brothers' farm, Maroondan.**

Soil Type.—Black clay typical of the area.

Variety.—M. 1900. Age of crop—Eighteen months.

RESULTS.

—	No Fertiliser.	250 lb. Sulphate of Ammonia.	250 lb. Sulphate of Ammonia + 300 lb. Superphosphate.	250 lb. Sulphate of Ammonia + 240 lb. Potash.	250 lb. Sulphate of Ammonia + 300 lb. Superphosphate + 240 lb. Potash.
Tons cane per acre	15·2	16·0	17·8	15·7	20·0
C.C.S. in cane	16·7%	17·0%	17·0%	16·8%	17·4%
Value of crop	£32 0 0	£34 9 0	£38 7 0	£33 6 0	£44 8 0
Less harvesting costs	£5 6 0	£5 12 0	£6 5 0	£5 10 0	£7 0 0
Return	£26 14 0	£28 17 0	£32 2 0	£27 16 0	£37 8 0
Increased return due to fertiliser	..	£2 3 0	£5 8 0	£1 2 0	£10 14 0
Cost of fertiliser and application	..	£2 1 0	£3 0 0	£3 11 0	£4 10 0
Profit or loss from fertiliser ..	..	Profit. £0 2 0	Profit. £2 8 0	Loss. £2 9 0	Profit. £6 4 0

Discussion.—Results were erratic; but, as was anticipated, good results have followed from the use of phosphate. The complete fertiliser showed an increase of almost 5 tons per acre over the plots receiving no fertiliser.

Location.—**P. Peterson's farm, Bingera.**

Soil Type.—This block is on the slope below a volcanic ridge, and is mixed volcanic-sandy loam.

Variety.—Black Innis. Age of crop—Eighteen months.

RESULTS.

—	No Fertiliser.	250 lb. Sulphate of Ammonia.	250 lb. Sulphate of Ammonia + 250 lb. Superphosphate.	250 lb. Sulphate of Ammonia + 400 lb. Potash.	250 lb. Sulphate of Ammonia + 250 lb. Superphosphate + 400 lb. Potash.
Tons cane per acre	15·5	16·2	17·1	21·6	22·0
C.C.S. in cane	13·0%	13·1%	13·0%	13·1%	13·2%
Value of crop	£22 10 0	£23 15 0	£24 16 0	£31 14 0	£32 11 0
Less harvesting costs	£5 9 0	£5 13 0	£6 0 0	£7 10 0	£7 15 0
Return	£17 1 0	£18 2 0	£18 16 0	£24 4 0	£24 16 0
Increased return due to fertiliser	..	£1 1 0	£1 15 0	£7 3 0	£7 15 0
Cost of fertiliser and application	..	£2 1 0	£2 17 0	£4 11 0	£5 7 0
Profit or loss from fertiliser ..	..	Loss. £1 0 0	Loss. £1 2 0	Profit. £2 12 0	Profit. £2 8 0

Discussion.—The response to potash has been quite marked on this trial. The heaviest dressing of fertiliser (900 lb. per acre) showed a profit of £2 8s. per acre. Undoubtedly the amount of potash applied was excessive.

Location.—**Eardley Brothers' farm, North Coast road, via Bundaberg.**

Soil Type.—Forest sandy loam; an important soil type of the area.

Variety.—D. 1135. Age of crop—Fourteen months.

RESULTS.

—	No Fertiliser.	60 lb. Sulphate of Ammonia.	60 lb. Sulphate of Ammonia + 250 lb. Super-phosphate.	60 lb. Sulphate of Ammonia + 300 lb. Potash.	60 lb. Sulphate of Ammonia + 250 lb. Super-phosphate + 300 lb. Potash.
Tons cane per acre	16·6	16·6	18·8	18·5	23·4
C.C.S. in cane	14·8%	14·7%	14·9%	14·8%	14·7%
Value of crop	£29 0 0	£28 14 0	£33 1 0	£32 6 0	£40 10 0
Less harvesting costs	£5 16 0	£5 16 0	£6 12 0	£6 10 0	£8 4 0
Return	£23 4 0	£22 18 0	£26 9 0	£25 16 0	£32 6 0
Increased return due to fertiliser	..	Decrease. £0 6 0	£3 5 0	£2 12 0	£9 2 0
Cost of fertiliser and application	..	£0 13 0	£1 9 0	£2 10 0	£3 6 0
Profit or loss from fertiliser ..	..	Loss. £0 19 0	Profit. £1 16 0	Profit. £0 2 0	Profit. £5 16 0

Discussion.—The results from the trial are not definite, but there was certainly a response to fertiliser. Due to a misunderstanding, the second dressing of sulphate of ammonia was not given, so the plots did not receive a full complement of nitrogen.

Location.—**C. N. Dahl's farm, Bundaberg.**

Soil Type.—Woongarra red volcanic loam.

Variety.—D. 1135. Age of crop—Thirteen months.

RESULTS.

—	No Fertiliser.	60 lb. Sulphate of Ammonia.	60 lb. Sulphate of Ammonia + 250 lb. Super-phosphate.	60 lb. Sulphate of Ammonia + 400 lb. Potash.	60 lb. Sulphate of Ammonia + 250 lb. Super-phosphate + 400 lb. Potash.
Tons cane per acre	20·1	20·7	21·1	20·7	21·0

Discussion.—The fertiliser has apparently shown no result on this trial.

Location.—**A. Adie's farm, Cordalba.**

Soil Type.—Red volcanic loam.

Variety.—D. 1135. Age of crop—Seventeen months.

RESULTS.

—	No Fertiliser.	250 lb. Sulphate of Ammonia.	250 lb. Sulphate of Ammonia + 250 lb. Super-phosphate.	250 lb. Sulphate of Ammonia + 400 lb. Potash.	250 lb. Sulphate of Ammonia + 250 lb. Super-phosphate + 400 lb. Potash.
Tons cane per acre	23·0	24·0	24·2	24·1	23·8

Discussion.—There appears to have been some inaccuracy in the returns of the individual plots in this trial, and therefore the results allow of no conclusions being drawn.

Location.—**T. Beattie's farm, Mount Bauple.**

Soil Type.—Stony hillside slope soil, characteristic of upland soils of the area.

Variety.—D. 1135. Age of crop—Eighteen months.

RESULTS.

—	No. Fertiliser.	250 lb. Sulphate of Ammonia.	250 lb. Sulphate of Ammonia + 250 lb. Superphosphate.	250 lb. Sulphate of Ammonia + 300 lb. Potash.	250 lb. Sulphate of Ammonia + 250 lb. Superphosphate + 300 lb. Potash.
Tons cane per acre	13·8	16·6	17·5	19·1	18·9
C.C.S. in cane	14·45%	14·3%	14·3%	14·5%	14·3%
Value of crop	£23 5 0	£27 1 0	£29 0 0	£32 6 0	£31 7 0
Less harvesting costs	£4 17 0	£5 16 0	£6 3 0	£6 14 0	£6 12 0
Return	£18 8 0	£21 15 0	£22 17 0	£25 12 0	£24 15 0
Increased return due to fertiliser	..	£3 7 0	£4 9 0	£7 4 0	£6 7 0
Cost of fertiliser and application	..	£2 1 0	£2 17 0	£3 19 0	£4 15 0
Profit from fertiliser	..	£1 6 0	£1 12 0	£3 5 0	£1 12 0

Discussion.—There appears to be a definite response from the use of nitrogen and potash on this type of soil. Conditions were adverse with this trial, and a deluge of rain after planting probably removed some of the fertiliser with the washed soil.

Location.—**F. N. Kirk's farm, Nambour.**

Soil Type.—Alluvial loam of Petrie's Creek; land requires provision for surface drainage. Excessively wet during heavy rains.

Variety.—Q. 813. Age of crop—Fourteen months.

RESULTS.

—	No Fertiliser.	75 lb. Sulphate of Ammonia.	75 lb. Sulphate of Ammonia + 250 lb. Superphosphate.	75 lb. Sulphate of Ammonia + 150 lb. Potash.	75 lb. Sulphate of Ammonia + 250 lb. Superphosphate + 150 lb. Potash.
Tons cane per acre	17·3	18·7	21·1	20·1	19·3
C.C.S. in cane	11·1%	10·9%	11·8%	11·3%	11·2%

Discussion.—Response to fertiliser appears to have been very slight, and the results are quite erratic. Soil variation is a serious factor here.

THE BUFFALO FLY

(Lyperosia exigua de Meijere).

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

THE buffalo fly affords an excellent example of an insect which, whilst unimportant in its native country, has upon introduction into a new land become a pest of serious dimensions. In the East Indies the fly is almost unknown as a harmful parasite of stock, but in Australia it bids fair to rival the cattle tick as a stock pest of outstanding importance. The reason for this may probably lie in the freedom it enjoys in Australia from the attacks of other insects which in the East Indies so parasitise it as to keep it under control. An alternative explanation may be found in a climatic or some other condition present in Australia which is more favourable to its development and rapid increase.

The buffalo fly belongs to the dipterous family Muscidæ, which, besides including the house fly, the bush flies, and blowflies, comprises a number of biting flies, other species of which are the stable fly of cosmopolitan distribution and the infamous tsetse flies of Africa.

The genus *Lyperosia* contains representative species in various parts of the world. *Lyperosia exigua* is known from the East Indies and Australia; *Lyperosia irritans,* the "horn fly" of the United States, was introduced from Europe, and is a serious pest of cattle in the former country. Three further species occur in the Soudan, all very common, but not regarded as very important parasites of native stock. One of these species, *Lyperosia minuta,* has been introduced to the Transvaal and Zanzibar, but in the latter country only is it regarded as a harmful pest of cattle.

Distribution in Australia.

The buffalo fly is thought to have been introduced into Australia with the first herd of buffaloes which landed at Darwin somewhere about 1826. For many years it remained confined to the country in and around Darwin, and, according to Mr. G. F. Hill, who was formerly Government Entomologist in the Northern Territory, it was not until 1911 that it attracted attention as a pest of cattle. At this time it occupied a range of country extending from the Liverpool River on the east to the Daly River on the west and bounded on the south by the Roper River, the coast line, of course, representing the northern limit. During the next fifteen years extensive movements of cattle occurred and the fly rapidly spread, so that at the end of this period its area of distribution, according to Mr. D. Murnane, of the Council for Scientific and Industrial Research, extended from Broome, West Australia, to the Robinson River on the east and to the watershed of the coastal rivers on the south—an area practically four times as large as that occupied in 1911. It first crossed the far north-western border of Queensland in 1928, and is now reported to be spreading eastward. The infested area in Queensland was surveyed by Messrs. J. H. Smith and J. E. Clegg, of this Department, towards the end of 1928. Dr. Legg, of the Stock Experiment Station, Townsville, also visited the infested area earlier in the year and reported the presence of buffalo fly.

Description and Habits.

The buffalo fly is a small, dark-grey, biting fly, a little more than half the size of the ordinary house fly. (See Plate 56.) Primarily a parasite of the buffalo, the insect has turned its attention to other animals, including cattle, horses, and man, for the purpose of obtaining food. Cattle constitute the preferred hosts, and horses and man are said to be attacked only at such times as they are among infested cattle. Unlike other biting flies such as mosquitoes, march flies, and sandflies, which visit the host only at such times as food is required, the buffalo fly remains on the animals night and day, and only when disturbed or for the purpose of laying eggs does it leave the host. When not feeding they rest in groups on the neck, shoulders, and rumps, in this differing from the American horn fly, which chooses the lower parts of the horns. Both male and female feed on blood, and for this purpose they force their way down among the hairs, elevate the wings, and assume an almost erect position. When disturbed the speed of their flight is astonishing, for, although covered by the hairs of the hide, at a switch of the tail or a toss of the head the flies instantly rise in a cloud for some little distance, returning again as quickly and resuming feeding.

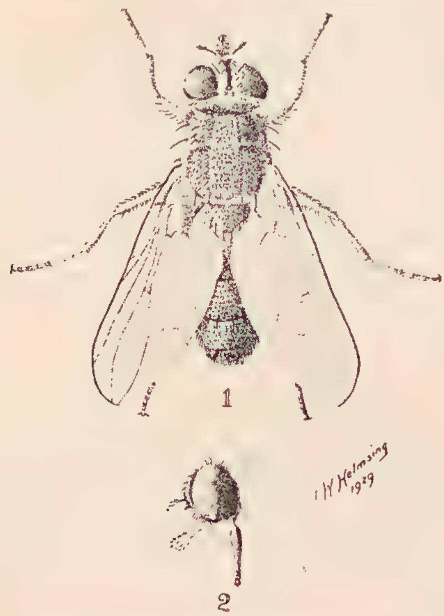


PLATE 56.—THE BUFFALO FLY (*Lyperosia exigua de Meijere*).

FIG. 1.—Adult x 8.

FIG. 2.—Head of Adult, lateral view x 8.

The Egg.

The egg of the buffalo fly is a tiny, elongate, shining brown body, and is deposited by the female fly in the freshly dropped dung of cattle and buffaloes. It was thought that the dung of native animals—kangaroos, wallabies, &c.—and that of horses might prove suitable for the development of the fly, but so far attempts to breed the flies under natural conditions from the dung of these animals have been negative. Unlike bovine fæces, this type of dung is apparently too dry for larval development. As soon as fresh fæces are dropped, the female flies leave

the animal to lay their eggs therein, the egg being deposited either on the surface or else in cracks and crevices. A number of eggs may be deposited in the one spot by a single female, which may lay many such batches in the one season. Under suitable conditions of temperature and moisture the egg may hatch in eighteen to twenty-four hours. Dryness and exposure to sunlight are harmful to the egg, which under such conditions rapidly decomposes.

The Larva.

The larva is a typical fly maggot, small in size and dirty white in colour. On hatching from the egg it immediately burrows into the dung, and keeps on burrowing as the surface layers dry out. Growth occurs fairly rapidly, and in three to five days the maggot is fully grown and ready to pupate.

The Pupa.

When ready to pupate the fully-grown maggot may either remain in the dung or else descend into the soil. The larval skin contracts, hardens, and turns brown. Within this brown, hardened case transformation of the larva to the adult takes place. This stages occupies three to five days, at the end of which the adult fly emerges, dries its wings, and is ready for its parasitic existence.

Duration of Life Cycle.

The complete life cycle occupies seven to eleven days under favourable conditions, the period, of course, being lengthened during the winter months or at any such times as the conditions are adverse to the fly's development.

Seasonal Distribution.

Although the buffalo fly is never quite absent throughout the year, there is a very marked seasonal variation. During the dry winter months the insects are so scarce as to warrant a most careful inspection of individual animals to detect their presence. Commencing with the advent of the rainy season in November they become more numerous, and in the wet months of January and February are at their maximum, gradually becoming less frequent with the approach of May and June.

Economic Importance.

No evidence has yet come to hand that the buffalo fly may be a vector of some deadly disease, but the possibility should always be borne in mind. The cattleman is only too familiar with the worry and irritation cattle suffer through the occasional attacks of mosquitoes, sandflies, and march flies, and with this knowledge the harm that such a parasite as the buffalo fly in its countless numbers and constant attendance may accomplish can well be imagined. Infested animals lose condition fairly rapidly, not only as a result of the blood-sucking habits of the flies, but also through the worry and irritation caused by their presence. When the pest is present in numbers, cattle are kept constantly on the move and feed only at such times as they may gain respite from the fly's attack. As a loss in the milk yield is associated with the presence of the horn fly in the United States, it is reasonable to assume that a similar loss in yield also occurs in the case of the buffalo fly. Moreover, its bite is particularly severe, and the efforts of the beasts to rid themselves of its presence by rubbing the affected parts against posts, tree trunks, &c., causes the formation of large raw areas

which attract other muscid flies—the bush fly and blowflies—which are conducive of further distress. Buffalo fly attack is already producing a noticeable effect on the cattle industry of the North, and should the infestation ever include the dairy and main beef herds of Queensland the loss will become very serious.

Measures for Buffalo Fly Control.

In America horn fly control measures entail killing the larvæ in the dung and also the use of certain fluids to be applied to the cattle which would prevent the fly's attack. Spreading and scattering the dung causes it to dry up and so make it unsuitable for larval development. These methods obviously could not be applied to the buffalo fly under such conditions as are found in the infested areas of the North. The application of repellants has been considered, but such application to every beast on the infested properties would be impracticable if not impossible, as it would entail endless mustering of cattle over many square miles of "wild" country. One other possible line of control remains—control by means of other insects which live on various stages of the fly. In the East Indies the insect is present, but is not known to exist in sufficient numbers to be a pest to local stock. Investigations by officers of the Council for Scientific and Industrial Research have shown that there are at least three parasites of the fly present in these islands which aid in reducing its numbers. These parasites are all tiny wasps of the family Ichneumonidæ. By the introduction to Australia of these and any other parasites which may be found, it is hoped that the buffalo fly may eventually be controlled. Meanwhile, in order to stay the spread of the fly until such time as biological control may play its part, the State authorities have seen fit to create a quarantine area in the far north-western corner of Queensland—an area comprising 6,000 square miles, which was gazetted early in 1929 shortly after the fly had appeared just over the border. Westmoreland crossing, which is the most northern stock route into Queensland, had previously been closed, and all movements of cattle from the quarantine area into the State were forbidden except through the more southern crossings. This means that cattle from the Northern Territory and the quarantine area may enter Queensland only at the Lake Nash and Camooweal crossings. It is believed that the belt of country between the infested area and these crossings forms a natural barrier to the spread of the fly, as the rainfall is too low for the development and increase of the pest.

Acknowledgment.

For much of the information on the life history of the buffalo fly, the writer is indebted to notes published by Mr. G. F. Hill, formerly Government Entomologist, Northern Territory.

A HELPFUL JOURNAL.

Two Toogoolawah farmers, renewing their subscription, write (21st *January,* 1921) :—"*. . . We find the Journal a great help in every way.*"

A Tara farmer writes (27*th January* 1931) :—"*As the years go by the Journal continues to improve, reaching a high standard of usefulness.*"

A Charters Towers subscriber writes:—"*It is a publication I would not be without.*"

AMERICAN FOUL BROOD.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

AMERICAN foul brood (see Plate 57) is an infectious disease resulting in the death of bee larvæ when they are fed with honey contaminated with the causal agent. This causal agent is a bacterium of the type which produces spores. These are reproductive bodies which are resistant to ordinary methods of disinfection, but are killed by being boiled for twenty minutes.

Symptoms.

The symptoms of the disease are as follows:—

(1) The colony is weakened. This is only noticed in the later stages of the disease.

(2) A portion of the brood is dead.

(3) The brood is irregularly distributed in the comb.

(4) A number of caps on brood cells are somewhat darker than normal, and may be perforated with one or more small holes, or may be sunken. They are especially liable to be sunken after a brood comb containing disease has been handled several times.

(5) Larvæ in uncapped cells just before they reach the stage for capping may be dead, but most of the dead brood will be found in capped cells.

(6) Larvæ just dead are yellow; they later turn coffee brown. Pupæ dead of the disease are coffee brown.

(7) With a toothpick (or similar article) a dead larva cannot be removed entire, as the decayed skin will break revealing a viscid mass which can be drawn out on the point of the toothpick to form a string one-half inch or more in length.

(8) In the later stages of the disease scales, consisting of dead brood, can be seen lying flat along the two lower sides of the cell. These are the remains of larvæ which have died before being capped and of larvæ and pupæ which have died in capped cells from which the caps have been subsequently removed by bees.

(9) There is an odour which resembles poor quality glue noticeable when a severely diseased hive is opened. This cannot be detected when only a few cells are affected on a comb some time after its removal from a hive.

European foul brood differs in that death of the brood occurs in uncapped cells more than in capped cells. The dead larvæ occur in unnaturally twisted positions. The scales formed in the later stages of the disease are less brittle. A foul odour may or may not be present. The contents of the dead larvæ are less viscid than in American foul brood.

Sacbrood differs in that the contents of the dead brood are watery, and that with care the dead brood can be removed intact. There is no odour, and no scales are formed.

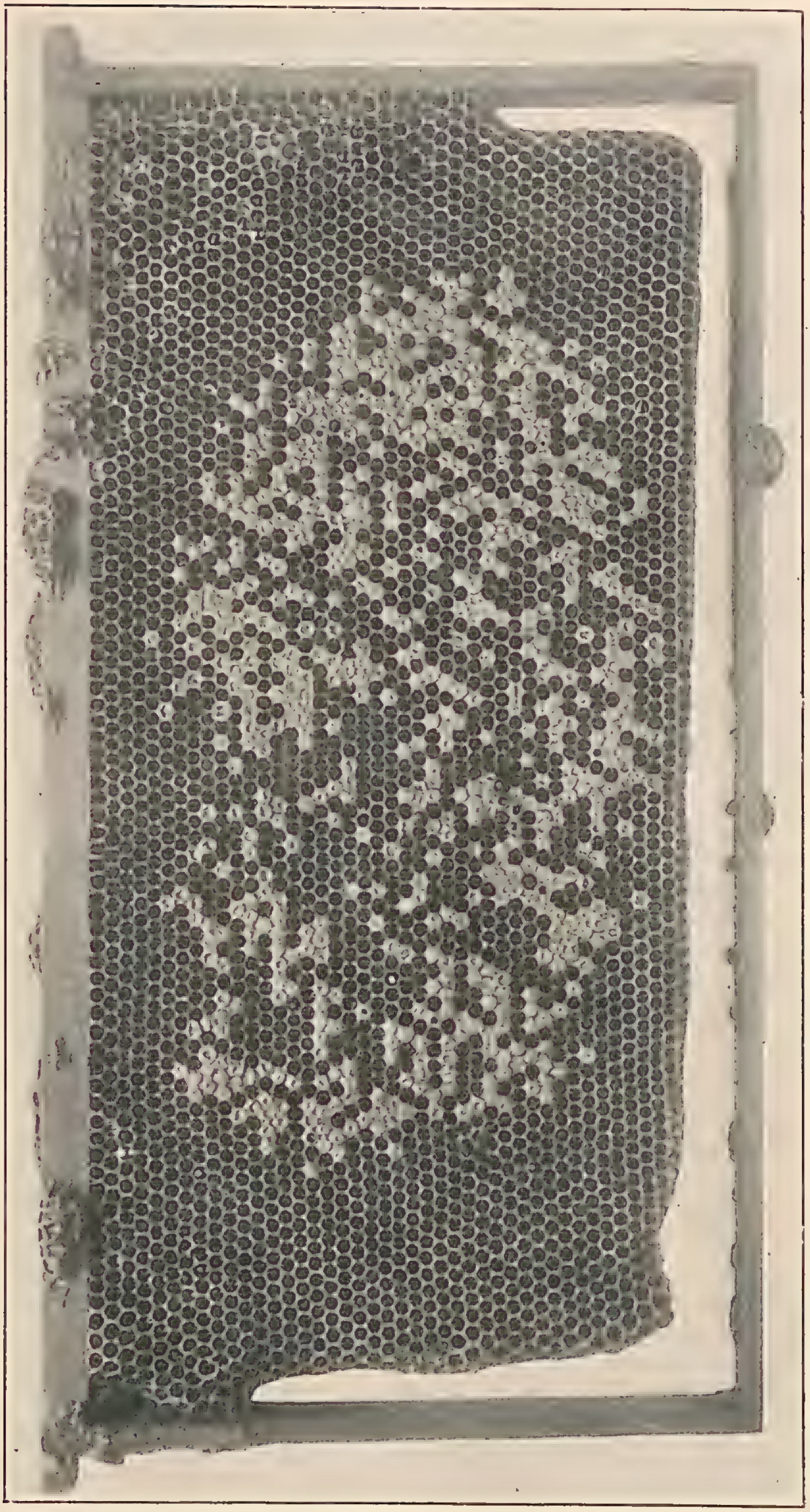


PLATE 57.—BROOD COMB INFECTED BY AMERICAN FOUL BROOD.

The ease with which the dead larvæ can be removed and the absence of ropiness will distinguish chilled brood, overheated brood, and starved brood from foul brood.

American foul brood attacks colonies of all strengths and at any season. The exact influence of climate has not been worked out, but it is generally considered that the disease is virulent in all climates in which bees are kept. There is no natural recovery from disease; a colony may die out rapidly or it may live for several years. The most rapid spread of the disease in a hive takes place when most brood is being reared, the quantity and quality of food available having little influence. Most new infections of hives occur when robbing is at its height. All races and strains of bees are susceptible. Bees attempt to clean out the disease by removing the dead brood, but as it breaks and leaves a portion of the infective material they are not successful. The disease is spread by contaminated honey obtained by the bees as honey fed to them by the beekeeper, as honey obtained by robbing infested hives or exposed frames from infected hives, or as honey left adhering to the sides of containers.

Precautionary Measures.

There is no known system of beekeeping which will surely prevent the appearance of American foul brood in an apiary, but the following precautionary measures will help to keep it away:—

(1) As far as possible prevent robbing.

(2) Do not feed honey bought on the market to bees.

(3) In introducing bought queens, destroy the accompanying cage, candy, and workers unless certain that the queen came from a disease-free apiary.

(4) If buying colonies, be sure they are disease free.

(5) Do not purchase old comb frames, &c.

Should the disease be present in an apiary, treatment is necessary. If only a few colonies are affected or the affected colonies are very weak, complete destruction of these colonies is desirable.

Treatment.

Destruction.—After the bees have stopped flying in the evening, close the entrance tightly. Sprinkle ½ pint of petrol over the top bars of brood combs. Close the top tightly. This will kill the bees. Next take the hive to a good fire in a hole sufficiently large to hold all honey which will run out of the combs as these are being burnt. Open the hive and place the combs one at a time on the fire. Finally add the hive with its cover, floor board, dead bees, &c. After everything has been burned cover in the hole.

Where complete destruction is not advisable the shaking treatment is used.

Shaking Treatment.—The treatment must be carried out during a honey flow, as at other times robbing from the frames as they were being removed would spread the disease. For the treatment the beekeeper requires a clean hive with frames and foundation only. He should also have a spare hive with a good cover besides his smoker and a newspaper.

The infected hive is smoked lightly. The hive with its floor board and cover is removed from its stand, and the clean hive put in its place with the newspaper spread out and weighted down in front of it. The infected hive is then opened and the frames removed one by one, the bees being shaken and brushed off on to the newspaper in front of their new quarters. It is desirable to shake the first frame as near to the entrance as possible, so that the bees quickly find their way in and do not wander excessively. As the frames are shaken they are placed in the spare hive and covered immediately to protect them from any possibility of robbing. When all the frames have been removed the last bees are shaken from the hive. After most of the bees have entered the hive, the newspaper should be burned and a strip of queen excluder placed over the entrance, to be removed after a few days. The old infected material should be removed and the frames burned by placing them separately on a good fire in a pit. The brush used should also be burned. The infected hives may be burned or may be saved for future use. In the latter case they should be cleaned and the insides carefully burned with a blowlamp till the wood appears scorched. Owing to the highly resistant state of the spores of *B. larvæ,* ordinary chemical disinfectants are quite unreliable for the disinfection of hives which have contained American foul brood. Special methods of disinfection have been evolved, but these are expensive and difficult of application.

While burning of all infected material is recommended, beekeepers treating numerous diseased hives may save the honey and wax. It is only advisable to attempt to extract the honey if it can be done in a securely screened honey house. Otherwise robbing during the extraction would spread the disease. The honey so extracted is quite safe for human consumption, but owing to the danger that bees may obtain access to receptacles which have contained contaminated honey, it should not be sold publicly, and due precautions taken in its use. The honey should on no account be fed to bees unless it is first sterilised by diluting it with an equal quantity of water and boiling vigorously for half an hour. The wax must all be rendered, and all refuse remaining burnt. The wax may then be safely used for comb foundation, &c.

In treating infested hives and handling infested material every precaution should be taken to prevent bees from robbing contaminated honey. Care should be taken not to spill such honey, or if it is spilled it should be carefully gathered and burned.

The hands should be well washed after handling the infected material, and the hive tool, smoker, bee veil, and any other instruments liable to become contaminated should be washed in hot water and washing soda. When brood raising commences after the shaking treatment it should be carefully watched for any recurrence of the disease. Should it recur, a second treatment must be given without delay.

TAKEN THE JOURNAL FOR THIRTY YEARS.

A well-known and progressive dairy farmer in the Pomona district writes (23*rd January,* 1931) :—"*I have had the 'Queensland Agricultural Journal' for thirty years, and always look forward to it, and appreciate the help I get from the Department.*"

THE OCCURRENCE OF A BEETLE *(Onthophagus granulatus* Bohen) IN THE STOMACH OF DOMESTICATED ANIMALS.

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

THE occurrence of Scarabæidæ in the intestinal tract of human beings in India and Ceylon is so frequent that the condition, though seldom or never serious, has a definite vernacular name, being in Sinhalese "Kurumini Mándâmâ" or beetle disease. In Australia, a dung beetle, *Macropocopris symbioticus* Arrow, lives in the anus of wallabies, and so far as the writer is aware this is the only published record of such beetles occurring in the intestinal tract of any animal other than human beings. The purpose of these notes is to record the presence of the bettle *Onthophagus granulatus,* from the stomach of the horse and calf.

The first instance of these beetles being found in the stomach of a horse was reported by Stock Inspector Comiskey, of Boonah. The animal was reported to have been ill for a period of three weeks. During this time little food was taken and the bowels were not known to have functioned. A post-mortem examination revealed large numbers of this beetle in the stomach, which was so extensively perforated that a large quantity of the contents had escaped.

A few months later specimens were forwarded for identification by Stock Inspector Taylor, Maryborough, who reported their occurrence in numbers in the paunches of calves which had died six to twelve hours after the first symptoms of illness. As more detailed information of infestations was not given, it cannot be said for certain that the animals had died as a result of the presence of the insects.

Little is known of the habits of *Onthophagus granulatus* except that it is to be found frequenting dung. The manner of infection can only be guessed at, but probably occurs either by swallowing the eggs, larvæ, or adults, or by the active efforts of the adults themselves. As these beetles or a similar species have been observed clinging to the anus of horses, the second explanation is more probably correct. It is presumed that the beetles are attracted to the anus whilst the animal is lying down, and, once entrance is gained, work their way up to the stomach.

STUDY OF QUEENSLAND GRASSES.

There is at present working on the botanical staff of the Department of Agriculture and Stock a botanist from England, Mr. C. E. Hubbard, who is a specialist on grasses. Mr. Hubbard intends leaving for England about the middle of April, but before he leaves is anxious to see as many specimens of Queensland grasses as possible. Specimens from far Northern and Western places are particularly desired, but any specimens are welcome, even of cultivated or naturalised grasses in the more settled parts of the State.

A request is made, therefore, to farmers and graziers to forward specimens to the Government Botanist, Botanic Gardens, Brisbane. If they are numbered and a duplicate or notes on the specimens sent is kept, then names corresponding to numbers and any information the Department possesses about the grasses can be forwarded in return. In this way the service can be of mutual benefit.

Specimens should consist of several flowering or seeding stems gathered from the base and bent backwards and forwards so as to roll comfortably in a piece of newspaper. The specimens should preferably be dried a short time before posting.

TUBERCULOSIS IN PIGS.

HOW IT AFFECTS THE FARMER'S POCKET.

COSTS PIG RAISERS MANY THOUSANDS OF POUNDS EACH YEAR.

DIRECTIONS FOR CONTROL.

What is Tuberculosis?

Tuberculosis is a disease of animals, humans, and birds, and is caused by a germ known as the tubercle bacillus.

Although animals under all conditions may contract the disease when exposed to infection, ill-nourished animals, and particularly those kept under insanitary conditions, are more likely to develop tuberculosis than animals that are well fed and cared for. Tuberculosis in pigs is usually associated with bad sanitation.

The organism causing the diseased condition may be transmitted to an animal through the food or drink, by inhalation, or by way of an abrasion of the skin. Once entrance is gained by the tubercle bacillus, the diseased condition (which is really a growth of tubercular nodules, and a degeneration of body tissues affected) develops in the animal's body, and any portion of the body may become affected; the parts which are usually first affected in the pig being the lymphatic glands of the throat, the lungs, and the intestines.

The disease is usually localised for a time, but later the germs may enter the blood stream when all parts of the body become affected, the condition known as generalised tuberculosis ensues. The rate of development of the disease is influenced by the virulence of the germs and the physical condition and resistance of the animal.

In the early stages, the disease is not easily detected. However, when the pig's carcass is submitted for examination by the meat inspector after slaughter, the tubercles, if present, are readily seen, particularly when the larger lymphatic glands throughout the body are examined.

In the advanced stages of tuberculosis, animals usually lose condition, have a harsh staring coat and skin, a persistent cough is frequently present, the eyes are dull, and the superficial lymphatic glands are sometimes noticed to be swollen and hard to the touch.

A peculiar feature about tuberculosis is the fact that, when a pig first becomes infected with the disease, there is seldom any outward appearance of unthriftiness and the pig may fatten rapidly, but eventually the disease gets a strong hold on the animal's body and emaciation becomes very apparent.

The Significance of Tuberculosis to the Queensland Pig Industry.

Tuberculosis is a dread disease among humans as well as among stock, and its presence in animals and their products used as food is a source of great danger to man; this gives reason for the existence of rigid systems of meat inspection in all civilised countries. Among other things, scientific meat inspection causes the condemnation and confiscation of meat infected with tuberculosis.

During the year 1929-30, of 318,350 pigs' carcasses examined 4,348 were condemned, representing 1·365 per cent., by State Government meat inspectors for tuberculosis in Queensland. In the same period,

PLATE 58.

Fig. 1.—The inspector is seen examining the lymphatic glands in the throat and neck.

PLATE 59.

Fig. 2.—Illustrates inspection of the lymphatic inguinal glands in the groin.

17,736 pigs' heads, representing 5·571 per cent., were also condemned. This represents a considerable loss to the industry and serves to emphasise the fact that concerted effort should be directed towards the eradication of the disease, as far as is practicable, before it reaches more serious dimensions. Apart from the number of pigs condemned at the slaughtering establishments, there are a number which die on the farm from tuberculosis, and the extent of this loss although considered serious cannot yet be estimated.

Pigs which, if sent to the bacon factory as porkers or baconers would have been found tubercular, are sometimes retained for breeding, and in many cases are active sources of infection to other pigs on the farm.

How the Pig Becomes Infected.

The germs may escape from the body of an infected animal in its milk, in discharges from the nose and mouth, in the droppings or in portions of the carcass which may be eaten by pigs, and by ingesting any of these body secretions the pig takes into its body the germs which cause the disease.

It is now accepted that congenital infection is very rare, but young pigs may become infected by milk and body discharges from a sow that is suffering from tuberculosis.

Unquestionably the use of milk from tubercular cows is the chief cause of pigs contracting the disease. Pigs which are allowed to drink raw milk or raw milk products, such as butter-milk or whey—either of which comes from a tubercular cow—may contract the disease.

The milk from one tubercular cow may infect all the milk with which it is mixed, and so pigs drinking any of this milk in an uncooked state would be liable to infection.

From a public health point of view and to ensure that nothing but thoroughly sound meat passes into the consumers' hands, a rigid system of meat inspection is practised at each of the bacon factories and pork-slaughtering establishments. Figs. 1, 2, and 3 illustrate different phases of this work, which is carried out under arrangement with the factories by Government meat inspectors.

The farmer has to carry the loss of all "condemns," hence it is in his interests also to eradicate disease in pigs and ensure a thoroughly healthy meat supply to the consuming population.

Control Measures.

I. Provide sanitary and comfortable accommodation for stock. Don't overcrowd pigs, but allow them ample room in well-drained grazing paddocks where possible. Use only well-made hygienic troughs and keep them clean. Remember that exposure to direct sunlight will destroy the tubercle bacillus, and so arrange sheds and troughs that direct sunlight will reach every part thereof.

II. When new stock have to be purchased, endeavour to secure them from healthy herds, and use only well-grown and vigorous pigs for breeding. Be cautious in the purchase of stores, and remember that it should be safer to breed pigs than to buy them in the open market.

III. Don't be too sparing with the food, but feed pigs plenty of wholesome foods in well balanced proportions, so that they will grow rapidly and be able to resist disease.

PLATE 60.

Fig. 3.—Illustrates inspection of the various lymphatic mesenteric glands and other portions of the viscera.

IV. If there is any reason to suspect tuberculosis on the farm have your dairy herd and your pigs inspected by an official of the Department of Agriculture and Stock so that necessary action may be taken. The services of the Department are at the disposal of the farmer, and arrangements may be made for an officer to inspect a dairy herd and to apply the tuberculin test to suspected cows. The tuberculin test is recognised throughout the world as being a safe and sure means of diagnosis.

V. Unless milk or milk products come from proved tubercle-free herds, it is advisable to pasteurise the milk before feeding it to pigs. This is recommended because it is well known that the germ is destroyed if held at a temperature of 155 deg. Fahr. for twenty minutes or at 180 deg. Fahr. for five minutes. Therefore, all doubtful milk should be heated to these temperatures as a safeguard against infection of pigs. In this direction buttermilk and whey should be efficiently pasteurised at the factories before being used as pig food.

VI. No diseased meat is allowed by law to be fed to any animal; but it is advisable that all meat fed to pigs should be thoroughly cooked in order to destroy any tubercle bacilli that may be present.

VII. Don't allow pigs to run in the same paddock as cattle, unless the cattle are proved tubercle free, as infection may be carried through the pigs eating their droppings.

VIII. Isolate for at least four weeks introduced pigs in a pen separate from other pigs. Also isolate any sick pig on the farm.

NOTE.—It should be remembered that although tuberculosis and other diseases cause farmers a considerable financial loss, the public is safeguarded by a thorough system of meat inspection that is carried on throughout the State by qualified Government meat inspectors.

Communicate with the Department of Agriculture and Stock for any further information on this matter.

THE FARMER AS AN ADVERTISER.

In an endeavour to increase the local consumption of pork products and focus attention upon the quality of the goods available, Mr. Mat Porter, a veteran Berkshire breeder, of Roselock, Wondai, Queensland, recently adopted a novel and successful scheme of advertising. Mr. Porter has been successful over a long series of years at both country and State Royal Shows and has accumulated a goodly number of trophies, cups, prize ribbons and cards. To more effectively draw attention to these he arranged for the manufacture into bacon of a number of selected pigs from his property, and when cured and ready for sale these pork products were exhibited in the show window of one of the local stores, together with descriptive cards, explanatory of the objective of the scheme. The storekeeper also increased his advertising vote to draw attention to reduced prices for bacon and ham by newspaper, circular, 'phone, and letter, advertised the goods he had for sale.

The result, to use Mr. Porter's own words, was that "whereas ordinarily, if the storekeeper sold 3 or 4 lb. of bacon in a day he was doing well, following on the display of these products there was a regular rush for the bacon and he cut up two flitches into rashers and sold them out and had to cut up a third and also two hams to meet the demand. The store never had such a rush of trade," continues Mr. Porter, "and it shows that if the business is judiciously handled quite a lot can be done by the individual breeder to encourage an increase in the consumption of these very appetising and nourishing meat products."

WEIGHING PIGS ON THE FARM.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

As both pork and bacon pigs are usually sold on a basis of weight and quality, and as the ruling price per pound paid varies according to specified weight limits, it is important to the pig raiser that he should have a fairly accurate knowledge of the weight of his animals before they are offered for sale.

On account of pig trucking days being two or more weeks apart in some districts, farmers are sometimes forced to market their pigs either too early or too late to have them at the most profitable marketing weights, but in very many cases a farmer is able to market his pigs to much better advantage when he is able to weigh them on the farm at regular and frequent intervals prior to trucking.

Even after years of practice guessing the weight of pigs is not so reliable as weighing them, and where regular consignments of pigs are sent from a farm the use of weighing scales can be recommended, as with intelligent use they will soon more than defray their cost in the saving of cash effected by marketing pigs at the most profitable weights.

PLATE 61.

Figure 1.—A wooden crate suitable for weighing pigs. Note the strong construction, "slide-up" doors at both ends, and wires coming from bottom of crate to be attached to the hook of the spring balance. Softwood should be used in the construction of the crate so that its weight will not be too great.

When a weighing appliance is installed on the farm, it will also be found useful for numerous purposes, both at the piggery and on other sections of the farm. With the equipment for weighing pigs and pig foods the farmer is able to carry out experiments in various methods of feeding and managing his pigs, the scale registering for him the advantage of one method over another.

Regular weekly weighings of young pigs will give a good indication of their rate of growth, and this really measures up the efficiency of the pig-raising business on the farm. If Saturday morning is the chosen time for this job, the children will be home from school and they would be very helpful to the farmer. With some organisation and quiet handling of the pigs, the weighing can be performed in comparatively little time and without much excitement to the pigs. The case with

which pigs can be weighed in a crate has been demonstrated by many Pig Club members who are able to crate their pig and weigh it without the assistance of another person.

The illustrations included in this article show suitable appliances for weighing pigs with a crate and a spring balance, a lever being used to move the crate off the ground when the pig is in, thus allowing the balance to take the weight.

A 300-lb. spring balance is required, as a crate will weigh approximately 100 lb. and a bacon pig weighs up to 170 lb. alive; a 300-lb. spring balance costs approximately £5 15s.

The crate should be light but strong, and a convenient size for a crate to hold one bacon pig is 3 feet 6 inches long, 2 feet 6 inches high, and 1 foot 6 inches wide (inside measurements).

PLATE 62.

Figure 2.—Crate in position, ready for use with front door closed. Note the arrangement of the top beam, lever and spring balance.

If the weighing crate is arranged in a race, the pigs can be brought from their yard, weighed, and then returned to the yard most conveniently.

There are many good methods of weighing pigs on the farm, and the most suitable method must be determined according to circumstances, but the suggestions given herein will be helpful to a large number of pig-raisers. Special platform scales with a pig crate built on can be purchased at prices around £50, but at such a price their use must be limited to places such as very large piggeries and trucking yards where large numbers of pigs are weighed.

SUGGESTED FORM FOR KEEPING WEIGHT RECORDS OF EACH LITTER OF PIGS.

Litter No.	Date of Weighing.	Live Weight.	Total Gain in Weight (lb.).	Daily Gain in Weight for Week, in lb.	Remarks.
1 (A)	1st March, 1931	28			
(B)		30			Litter born 4th January, 1931, from "Topsy." Weaned 1st March, 1931. Ten born; eight weaned.
(C)		34			
(D)		29			
(E)		33			
(F)		31			
(G)		36			
(H)		30			
		251			
(A)	8th March, 1931	31	3	·4	
(B)		34	4	·5	
(C)		37	3	·4	
(D)		32	3	·4	
(E)		37	4	·5	
(F)		35	4	·5	
(G)		39	3	·4	
(H)		35	5	·7	

A simple method of ascertaining the estimated dressed weight of bacon and pork pigs when the actual live weight is known is as follows:—(This is approximate only, but acts as a guide.) Say live weight is 170 lb.

170 lb. x 7 = 1,190 lb. Strike off last figure thus:—1,19|0 leaving the estimated dressed weight of 119 lb., i.e., 70 per cent. of the actual live weight. Porkers should be marketed when between 60 lb. and 100 lb. dressed weight and baconers when between 100 lb. and 120 lb. dressed weight.

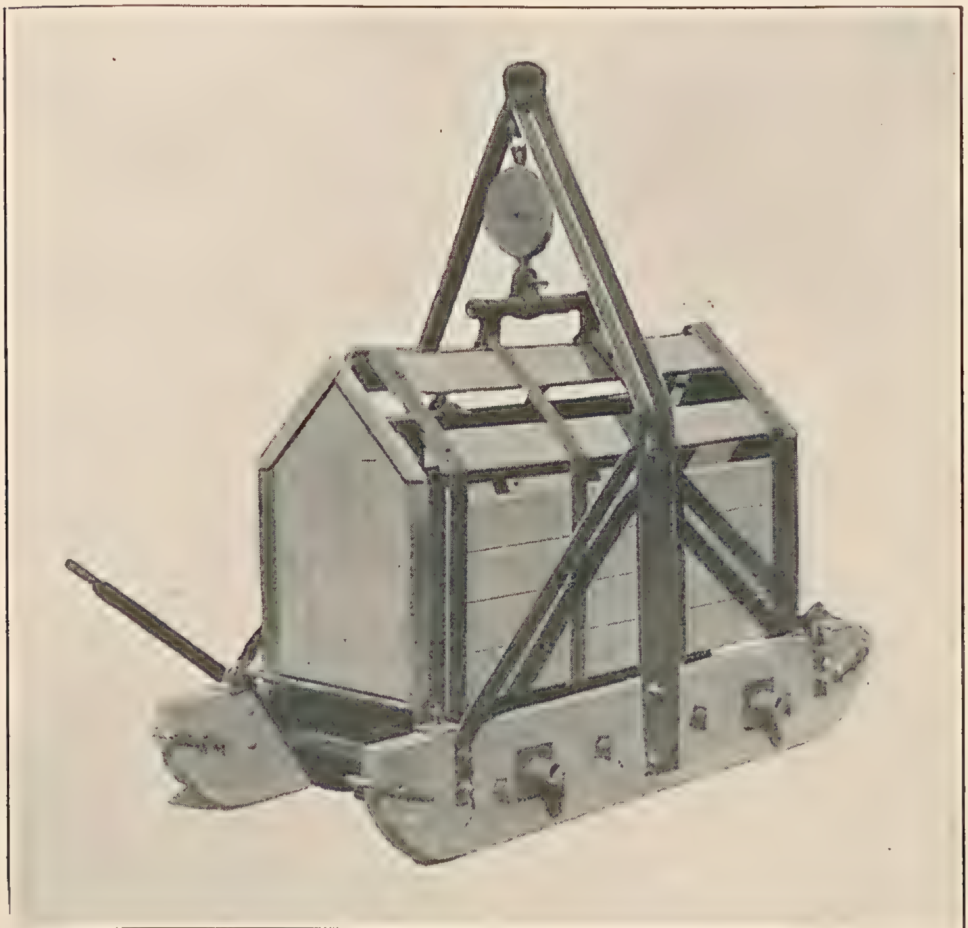


PLATE 63.

Figure 3.—A movable weighing appliance for porkers and baconers, designed. constructed, and patented by the Forster Engineering Works of Brisbane. This weigher has been in use at several Pig Club Shows in Queensland and has proved satisfactory. It is built on two skid runners; the iron lever on the side enables the crate to be suspended, putting the weight on to the spring balance which is hung on the top of the frame. The sliding bar below the balance allows the operator to adjust the balance if the pig stands to one end of the crate. The doors at both ends of the crate slide up at the top so that the pig may walk in at one end and out the other.

CASTRATION OF PIGS.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

RECENT inquiries indicate that there are still numerous farmers who neglect to attend to the operation of castration on young boar pigs not intended for use as stud sires, until these pigs are three, four, or even five months of age. This is a serious mistake and results in considerable pain and loss of growth plus additional risk both from death as a result of complications and reduced value on slaughter for after effects in the form of improperly healed wounds and other objectionable features. Many otherwise suitable pigs are rejected for export and are classed as second or third grade as a result, even if they are passed as fit for human consumption.

The following rules should be strictly observed in order to avoid loss and ensure a satisfactory job:—

(1) Realising that there is no more important job associated with the raising and marketing of pork and bacon pigs than that of having animals of the right type in the best condition at the time they go forward to the factory or buyer, no effort should be spared to study closely the correct methods of handling, castration, &c.

(2) Castration is a simple surgical practice, essential in the preparation of male pigs for the meat market. Experience and observation will enable even the beginner to carry the operation through without loss if the correct methods are followed.

(3) It is preferable for the inexperienced to have some initial training in the operations by assisting an experienced operator if this is possible; otherwise practice on a porker already slaughtered and dressed or on a pig that has died of one or other complaints causing fatalities.

(4) In all cases carry out the operation on pigs six weeks of age if this can be arranged. There is considerable risk when working on a more mature animal, and the operation is a very much more difficult one.

(5) There is no need to attempt speying of the female pig, as this operation is not necessary in ordinary practice on Australian farms.

(6) The animal should be without food for at least fifteen hours before the operation is performed. In the case of young pigs not yet weaned, do this by taking the sow away from the suckers and placing her in a clean pen away from sight or sound of her family, or make some similar arrangement in the case of older pigs. In any case the pig should have an empty stomach at the time of the operation, though there is no objection to the pig having clean drinking water during this temporary fast. This is even more important in the case of aged pigs. They should fast for twenty-four hours or more.

(7) Have your castrating instruments, cloths, bucket, &c., thoroughly clean and in good order. Sterilise the knife and cloth by placing in boiling water for a few minutes before use, and then cool off or immerse in a strong disinfectant before and after operating on each pig. The knife should have a keen edge. It is not necessary to use an emasculator in the case of very young pigs, but this instrument should always be used when older pigs are being castrated, particularly for aged boars (if it has been decided worth while operating on an aged animal). The fact that so many pigs suffer intense pain, or even succumb as a result of castration, that they suffer as a result of the formation of abscesses or tumors in the scrotum (or sac in which the testicles are normally situated), and that the resultant wounds fail to heal rapidly or other complications follow, is invariably due either to carelessness, ignorance, or improper methods. A great many of the troubles can be traced to performing the operation in unfavourable weather, in insanitary surroundings, and last but not least to the use of unclean instruments. It is not uncommon to see farmers take out their pocket knives that have, possibly, been used for cutting tobacco or what not, give them a rub up on an oilstone, steel, or the back of their boot, and proceed to castrate their pigs without any sterilisation or treatment by dipping the knife in disinfectant. The result is frequently infection by germs and abscess formation with suppurating wounds that will not heal. The writer has seen pigs castrated in sties where they were ankle deep in the mud and slush. The operator's hands should be cleansed, as also should the cloths used for washing the parts before and after the operation. A clean bowl or bucket and a supply of luke-warm to hot water is also essential. The experienced operator will be able to do the work rapidly and with little or no trouble, the latter depending largely upon the skill of one or more of his attendants, for in the case of an aged pig it certainly is a two (or more) man job.

A good castrating knife that will keep a keen edge may be purchased at from 6s. to 10s. A 3-inch blade is a convenient size for ordinary castration. Emasculators are much more expensive, being quoted at from 50s. upwards according to make and size. Emasculators with a triple crush action are to be preferred for ordinary farm work. Absolute cleanliness in all operations is essential to good results.

(8) Select a clear, dry, cool day during which to perform the operation of castration—the animals should not be operated on during a cold rainy day nor during very cold windy weather. When it is possible to do so, avoid the operation during early spring, when blowflies are so active. All the pigs that are to be operated upon should be placed in a pen just large enough to hold them; this is to facilitate catching them and to lessen excitement among the animals. Another pen cleansed as mentioned above should be close at hand to receive the pigs after each one is completed.

(9) As disinfectants, use a 3 per cent. solution of some carbolic disinfectant, or sheep dip, or Jeyes' or Condy's Fluid.

Suitable antiseptic oils for use (after the operation and in order to keep flies from worrying the animals) may be made up from the following receipes:—

Recipe No. 1.—Specially advised for farm and homestead use for application to open wounds, sores, &c., is made up by dissolving 1 oz. of iodoform in 14 fluid oz. of eucalyptus oil. When quite clear add 1 pint of olive oil. Shake well and bottle and label distinctly "Antiseptic Oil No. 1."

Recipe No. 2 is more suitable for aged pigs in which the wounds are more pronounced, and in which the healing process is more lengthy. It combines the active ingredients of the above with a more tenacious and adherent basis. Olive oil is replaced by Stockholm tar. The formulæ in this case will be: Dissolve 1 oz. of iodoform in 14 fluid oz. of eucalyptus oil. When dissolved and quite clear add 1 pint of Stockholm tar. Shake well, bottle and label distinctly "Antiseptic Oil No. 2."

These antiseptic oils are much preferable from a humane standpoint, and, as they stimulate natural healing processes and repel flies, are to be recommended in preference to kerosene and fat or other bush remedies.

NUTRITION OF SHEEP.

By J. C. BRÜNNICH AND W. R. WINKS.

ANALYSIS OF PAUNCH CONTENTS.

IT has always been a great difficulty to obtain samples of the food consumed by sheep on pastures; and in times of drought, with scarcity of grass, it is often a mystery to ascertain on what material the sheep actually live. When obtaining samples of roughage, grass, stubble, &c., it is frequently the case that the samples submitted for analysis are really the food refused by the animals, unless the stalks show actually signs of being bitten off. One of the great advantages of giving phosphatic licks to sheep on pasture is the fact that the animals are induced to take more bites of such coarse roughage and are better able to digest such fodder than animals which get no licks.

As the paunch or rumen of any ruminant is simply considered a large reservoir for the storage of the bulky food consumed by the animal, it was thought that the analysis of the contents of paunches would give a reliable indication of the actual composition of the food consumed, but unfortunately this apparently does not apply to all the constituents, and the addition of large amounts of saliva adds considerable amounts of mineral matters, more particularly phosphoric acid, to the food contained in the rumen. In many cases, however, valuable information can be obtained from the analysis of paunch contents. Already last year, in the annual report of the Agricultural Chemist, the analysis of the paunch contents of a 1½-year-old wether, killed in the Longreach-Blackall district (Analysis 2541, Table I.), was reported and commented on.

Food at that time was very scarce; the roughage of Mitchell and blue grass in the paddocks contained only about 4 per cent. of crude protein with 0.36 per cent. of lime and 0.27 per cent. P_2O_5, whereas boree and gidgea leaves contained 11.4 per cent. protein, 3.4 per cent. CaO, and 0.15 per cent. P_2O_5, so that the wether must have consumed a very considerable amount of leaves of such shrubs to give a paunch content with 11.4 per cent. protein, 3.14 per cent CaO, and 0.68 per cent. P_2O_5. At

that time of reporting a possible increase of the P_2O_5 contents in paunch due to saliva was not suspected. We were not able to find in any of the literature available a complete analysis of sheep saliva. In the "Tabulæ Biologicæ" we find sheep saliva to contain 98.9 per cent. water and 1.1 per cent. solid matter; human saliva with 99.5 per cent. water and 0.3 per cent. organic solids and 0.18 per cent. ash, and the ash itself to contain about 14 per cent. chlorine, 37 per cent. potash, 17.7 to 25.7 per cent. phosphoric acid, and only 2.2 to 3.9 per cent. lime.

Assuming the ash of sheep saliva to be of similar composition, the large amount of P_2O_5 in paunches is easily accounted for. The analysis of liquid—a few ounces collected in the paunch of a sheep purposely killed—(Table IV.) shows it to contain 98.2 per cent. water, 0.86 per cent. organic solids, and 0.94 per cent. ash, with 0.05 per cent. chlorine, 0.20 per cent. P_2O_5, and 0.036 per cent. CaO, which agrees very closely with the quoted analysis.

The food consumed by the wether under discussion was evidently too low in phosphoric acid, and the deficiency was made up by a supply of this necessary mineral constituents by the saliva. This phosphorus deficiency is aggravated by a great excess of lime, a very common occurrence with our scrub feeds, and the nutrition of sheep in the Longreach-Blackall district would undoubtedly be greatly benefited by a supply of phosphatic lick, as the supply of the necessary phosphoric acid from the body of the animal itself through its saliva to the food cannot go on for ever.

An Interesting Comparison.

It is interesting to compare the analysis with the analyses of paunch contents of well-nourished aged wethers from Pittsworth and Thane (Analyses 2628 and 2146, Table I.), where the sheep received satisfactory rations. A large number of analyses of paunch contents from the Springsure district are also of interest, particularly as the sheep lived under droughty conditions, and the effects of the use of phosphatic licks is clearly shown.

The results of the analyses carried out during the year were so startling that it was considered advisable to kill sheep which were fed under control and were available at the Yeerongpilly Stock Experiment Station in connection with stomach worms investigation, for the purpose of securing the contents of all the digestive organs.

The first sheep killed, September, 1930 (Table II.), was fed on ordinary lucerne chaff, but had also a little picking on a particularly bare paddock. The analysis of the contents of paunch and other stomachs do not show anything abnormal, only the amount of P_2O_5 is about double the amount expected.

The next sheep killed (Table III.) was kept the whole time in a stall and was fed with lucerne chaff only, and was in fair condition. The sample of the lucerne was taken from bulk and also from the food in the feed box, and the two analyses agree very closely. The contents of the paunch were again lower in protein and carbohydrates than was found in the feed, but higher in fibre and ash, higher in lime, and very much higher in phosphoric acid, containing practically three times as much phosphoric acid as was found in lucerne. The quite astonishing increase in the protein amount found in the small intestines was thought to be due to an admixture of chyme, as the intestines were squeezed to get the contents, but this is evidently not the case, as the stomach contents of the last sheep killed (Table IV.) showed a similar increase.

The last sheep killed in December was also kept in a stall and fed for several months on a fair quality of bush hay, which was too poor in protein to supply an adequate balanced ration; the sheep fell away rapidly and was very emaciated when killed. The protein in the paunch contents was considerably higher than that of the food, and phosphoric acid again showed a very large increase. Very remarkable is the great loss of chlorine from food to paunch. The composition of the few ounces of free liquid found in the paunch has already been referred to, and is evidently practically pure saliva. The contents of the small intestine were obtained without any pressure, but simply by cutting the intestines open with a pair of scissors.

The change of human saliva in quantity as well as in composition by various foods is a well-established fact, and it would be interesting to ascertain if saliva of a sheep varies with the class of food, more particularly if continued use of a phosphorus-deficient fodder will increase the amount of phosphorus in the saliva, and if the large amount of phosphoric acid in circulation is influenced by supplying phosphatic licks.

TABLE I.—CONTENTS OF PAUNCHES OF VARIOUS SHEEP.

—		Lab. 2,541, Paunch. Isis Downs, Blackall. Killed, 28-11-29.	Lab. 2,628. Paunch. Dunbar, Pittsworth. Killed, —-11-30.	Lab. 2,146. Paunch. Torridon, Thane, S. W. Line. Died, 27-10-30.	Lab. 598. Paunch No. 1. Meteor Downs, Springsure. Killed, 23-7-30.	Lab. 1,227. Paunch No. 2. Meteor Downs, Springsure. Killed, 29-8-30.	Lab. 1,665. Paunch No. 3. Meteor Downs, Springsure. Killed, 22-9-30.	Lab. 1,948. Paunch No. 4. Meteor Downs, Springsure. Killed, 11-10-30.	Lab. 2,608. Paunch No. 5. Meteor Downs. Springsure. Killed, 1-12-30.	Lab. 2,609. Fæces, Meteor Downs, Springsure. Killed, 1-12-30.	Lab. 1,690. Lamb's Paunch. Meteor Downs, Springsure. Died, 24-9-30.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Mositure on Air-drying		6·4	6·5	2·1	8·2	9·1	7·2	8·6	7·1	6·4	9·6
Analysis of water-free material.	Crude Protein	11·4	17·9	17·4	15·2	12·9	13·6	14·4	11·7	8·0	12·6
	Carbohydrates	38·3	31·2	35·5	41·6	34·0	43·2	41·5	41·9	39·9	34·0
	Crude Fat	1·2	1·1	1·0	1·4	1·2	1·1	1·1	1·6	2·0	2·3
	Crude Fibre	32·2	31·9	29·3	22·5	26·6	21·1	21·3	23·6	18·9	29·1
	Crude Ash	16·9	17·9	16·8	19·3	25·3	21·0	21·7	21·2	31·2	22·0
	Lime (CaO)	3·139	2·539	2·220	0·744	2·022	0·917	1·249	1·062	1·747	1·932
	Phosphoric Acid (P_2O_5)	0·678	2·401	2·354	1·642	3·345	1·982	2·133	1·210	1·735	3·153
	Total Sulphur (S)	..	0·334	0·741	0·260	0·254	0·213	0·281	0·223	0·210	0·228
	Potash (K_2O)	..	1·692	..	0·988	0·940	..	..	1·00	0·580	..
	Total Chlorine (Cl_2)	..	0·258	..	..	..	..	..	0·328	0·144	..

Lab. 2541.—From 1½ year wether in good condition, killed for mutton.
Lab. 2628.—From an aged wether in prime condition, killed for mutton; fed on an excellent mixture of pasture including young wheat.
Lab. 2146.—From a 6½ years old wether, asphyxiated while being given a drench. The animal had been on mixed pasture for 24 hours prior to death, before which time he had been fed on lucerne.
Lab. 598.—From an old wether in fair condition.
Lab. 1227.—From a fat wether that had been without lick for some time Run on short burned feed where cattle had been, and which was without sheep for some time. Had access to lick shortly before being killed.
Lab. 1665.—From a fat wether on ordinary sheep country. No lick for two months prior to death.
Lab. 1948.—From a wether in a paddock containing only "white seed" yet sheep went from poor condition to good mutton.
Lab. 2608.—Grazed under store conditions similar to Lab. 1948. Potassium permanganate at the rate of 38 lb. to twenty thousand gallons added to water; given as an alleged cure for stomach worms.
Lab. 1690.—Paunch of a lamb that died from a disease similar to tetanus. Death may have been caused by a poison weed.

TABLE II.—ANALYSES OF CONTENTS OF PAUNCH AND OF THE DIGESTIVE ORGANS OF A SHEEP SLAUGHTERED 23RD SEPTEMBER, 1930.

—		Lab. 1,543. Paunch or Rumen.	Lab. 1,544. Second Stomach or Reticulum	Lab. 1,545. Third Stomach, Bible or Omasum.	Lab. 1,546. Fourth Stomach or Abomasum.	Lab. 1,548. Blind Gut or Cæcum.	Lab. 1,547. Fæces before Excretion.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Moisture on Air-drying		6·2	5·6	4·6	3·2	4·5	4·1
Analysis of water-free material.	Crude Protein	19·0	19·1	16·0	18·0	13·0	14·2
	Carbohydrates	33·4	33·9	35·6	30·3	38·7	39·2
	Crude Fat	1·1	0·6	1·3	4·4	1·4	1·9
	Crude Fibre	33·9	30·0	30·6	23·8	27·4	26·7
	Crude Ash	12·6	16·4	16·5	23·5	19·5	18·0
	Lime (CaO)	1·625	1·684	2·114	1·666	2·910	2·860
	Phosphoric Acid (P_2O_5)	1·743	2·261	2·493	2·951	1·436	1·538
	Total Sulphur (S)	0·242	0·246	0·238	0·366	0·243	0·179

s sheep was fed on lucerne chaff and grass picking only. It had no lick of any kind.

TABLE III.—ANALYSES OF FEED AND MATERIALS FROM THE DIGESTIVE ORGANS OF A SHEEP SLAUGHTERED 4TH NOVEMBER, 1930.

	—	Lab. 2,173. Paunch or Rumen.	Lab. 2,174. Second Stomach or Reticulum.	Lab. 2,175. Third Stomach. Bible or Omasum.	Lab. 2,176. Fourth Stomach or Abomasum.	Lab. 2,177. Blind Gut or Cæcum.	Lab. 2,179. Small Intestine.	Lab. 2,178. Fæces before Excretion.	Lab. 2,181. Fæces from Pen after Excretion.	Lab. 2,180. Urine from Bladder. †	Lab. 2,182. Lucerne Chaff from Bulk Sample as Fed to Sheep.	Lab. 2,183. Lucerne Chaff actually taken from Feed Box of Sheep.
	Moisture on Air-drying	Per Cent. 6·5	Per Cent. 10·9	Per Cent. 12·1	Per Cent. 8·5	Per Cent. 10·2	Per Cent. 7·2	Per Cent. 13·3	Per Cent. 8·1	Per Cent. ..	Per Cent. 10·3	Per Cent. 10·3
Analysis of water-free material.	Crude Protein	22·1	22·2	20·7	27·6	17·3	35·7	17·4	18·3	Nitrogen 0·87	26·2	26·1
	Carbohydrates	27·1	26·0	26·2	*24·6	29·9	*32·2	30·2	31·6	..	40·5	40·2
	Crude Fat	1·7	2·1	2·5	Sample too small	2·1	Sample too small	2·4	1·7	..	1·5	1·5
	Crude Fibre	35·7	34·6	36·8	25·2	35·1	20·7	37·4	34·5	..	21·2	20·7
	Crude Ash..	13·4	15·1	13·8	22·6	15·6	11·4	12·6	13·9	..	10·6	11·5
	Lime (CaO)	2·108	2·364	3·644	1·958	4·366	1·980	4·417	4·807	..	1·823	1·798
	Phosphoric Acid (P_2O_5) ..	2·568	3·223	3·980	3·062	2·146	2·620	1·697	2·165	0·0145	0·846	0·837
	Total Sulphur (S) ..	0·286	0·378	0·280	Sample too small	0·318	0·805	0·359	0·356	0·070	0·262	0·238
	Total Chlorine (Cl_2) ..	0·527	Sample too small	0·856	Sample too small	1·059	1·454	0·401	0·218	0·163	0·760	0·760

* Includes crude fat. † Absolute analysis of liquid, not of water-free material.

Total weight of offal including heart, liver, &c., 22 lb. 13 oz.
Total weight of contents of Digestive Organs, 12 lb. 10 oz.
Weight of empty Digestive Organs, 5 lb. 4 oz.
Weight of heart, liver, &c., 4 lb. 15 oz.
P.H. of Second Stomach, 6·66 (Quinhydrone).
P.H. of Fourth Stomach, 5·65 (Quinhydrone).

Weight of Contents of—
Paunch, 9 lb. 13 oz.
Second Stomach, 5½ oz. with 75·7 per cent. moisture.
Third Stomach, 4½ oz. with 80·5 per cent. moisture.
Fourth Stomach, 6½ oz. with 94·0 per cent. moisture.
Blind Gut, 14½ oz. with 84·6 per cent. moisture.
Fæces, 6 oz. with 74·0 per cent. moisture.
Small Intestine, 7 oz. with 76·8 per cent. moisture.

TABLE IV.—ANALYSIS OF FEED, PAUNCH, AND STOMACH CONTENTS OF A SHEEP SLAUGHTERED 11TH DECEMBER, 1930.

——	PAUNCH OR RUMEN.		Lab. 2,774. Second Stomach, or Reticulum.	Lab. 2,775. Third Stomach, Bible or Omasum.	Lab. 2,776. Fourth Stomach or Abomasum.	Lab. 2,777. Blind Gut or Cæcum.	Lab. 2,779. Small Intestine.	Lab. 2,778. Large Intestine.	Lab. 2,780. Fæces just before Excretion.	Lab. 2,781. Urine from Bladder. †	Lab. 2,813. Roughage Fed to Sheep.
	Lab. 2,773. Solid.	Lab. 2,784. †Liquid, chiefly Saliva.									
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Moisture on Air-drying	7·9	§98·2	7·2	5·0	6·4	8·7	6·8	14·7	7·8	..	8·3
Analysis of water-free material. Crude Protein	10·3	0.189 Nit. ·029	9·1	11·5	16·7	10·4	24·4	8·8	9·5	5·31 Nit. 0·85	6·5
Carbohydrates	40·4	..	*33·5	43·4	..	43·5	*40·2	44·0	*46·9	..	45·8
Crude Fat	0·5	..	Sample too small	1·2	..	0·8	Sample too small	0·9	Sample too small	..	0·7
Crude Fibre	33·6	..	42·7	26·3	..	23·7	16·0	24·5	23·4	..	34·9
Crude Ash..	15·2	0·94	14·7	17·6	30·3	21·6	19·4	21·8	20·2	..	12·1
Lime (CaO)	0·608	0·036	0·966	0·730	0·718	0·957	0·601	0·945	1·021	..	0·537
Phosphoric Acid (P_2O_5) ..	1·741	0·201	1·918	1·875	1·732	1·610	2·037	1·608	1·664	0·009	0·678
Total Sulphur (S) ..	0·206	0·016	Sample too small	0·204	..	0·265	0·749	0·322	0·372	..	0·252
Total Chlorine (Cl_2) ..	0·270	0·053	Sample too small	0·642	..	0·988	1·883	1·166	0·593	0·213	0·797

* Includes crude fat. † Absolute analysis of liquid, not of water-free material.
§ Total solids, 1·804 per cent.; organic matter, 0·86 per cent.; mineral matter (ash), 0·94 per. cent.

Sheep was emaciated and dressed sheep weighed only 26 lb. Total weights of Digestive Organs and Contents with Heart, Liver, &c., 20 lb. 7 oz.
Weight of Contents of Digestive Organs, 10 lb. 14 oz.

Weight of Contents of—
Paunch, 8 lb. 11 oz. with 82·3 per cent. moisture.
Second Stomach, 1 oz. with 83·9 per cent. moisture.
Third Stomach, 6 oz. with 82·2 per cent. moisture.
Fourth Stomach, 1 oz. with 89·6 per cent. moisture.

Weight of Contents of—
Blind Gut, 9 oz. with 83·5 per cent. moisture.
Small Intestine, 10 oz. with 75·7 per cent. moisture.
Large Intestine, 1 lb. with 85·2 per cent. moisture.
Fæces, 4 oz. with 75·1 per cent. moisture.

CLIMATOLOGICAL TABLE—JANUARY, 1931.

Supplied by the Commonwealth of Australia Meteorological Bureau, Brisbane.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·82	89	76	97	3	72	21	1145	16
Herberton	..	84	66	94	3	59	1	406	10
Rockhampton	29·87	94	75	104	3, 12	69	29	324	7
Brisbane	29·91	89	72	100	11	67	21, 22, 29	454	10
Darling Downs.									
Dalby	29·88	95	..	107	2, 6	..	..	143	6
Stanthorpe	..	88	60	99	13	53	4	165	5
Toowoomba	..	87	63	99	12	56	23	623	10
Mid-interior.									
Georgetown	29·80	97	75	107	4	67	1	609	10
Longreach	29·79	103	75	112	12	66	3, 29	50	2
Mitchell	29·85	97	69	107	12, 13	53	21	143	4
Western.									
Burketown	29·79	93	76	105	4	71	12	804	13
Boulia	29·79	103	76	115	7	66	21	119	2
Thargomindah	29·83	95	74	106	8, 13, 17	63	19, 26	19	2

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of January, in the Agricultural Districts, together with Total Rainfall during January, 1931, and 1930 for Comparison.

Divisions and Stations.	Average Rainfall. Jan.	No. of Years' Records.	Total Rainfall. Jan. 1931.	Jan. 1930.
North Coast.	In.		In.	In.
Atherton	11·65	29	10·42	23·99
Cairns	16·24	48	17·42	33·06
Cardwell	16·46	58	11·72	38·58
Cooktown	14·21	54	11·45	30·60
Herberton	9·63	43	4·06	17·46
Ingham	15·94	38	11·54	25·24
Innisfail	20·03	49	20·63	34·67
Mossman	15·08	17	29·77	42·93
Townsville	11·29	59	1·43	17·58
Central Coast.				
Ayr	11·44	43	3·95	14·36
Bowen	10·20	59	2·09	20·46
Charters Towers ..	5·54	48	1·43	11·19
Mackay	14·22	59	3·82	30·70
Proserpine	16·14	27	10·00	28·53
St. Lawrence	9·62	59	2·28	17·47
South Coast.				
Biggenden	5·38	31	2·03	9·83
Bundaberg	9·06	47	2·79	15·92
Brisbane	6·49	80	4·54	9·94
Caboolture	7·77	43	11·05	11·17
Childers	7·82	35	2·99	14·02
Crohamhurst ..	12·74	37	..	22·91
Esk	5·84	43	4·06	7·71
Gayndah	4·72	59	1·40	9·29
Gympie ..	6·75	60	5·56	12·11
Kilkivan	5·64	51	4·21	10·89
Maryborough ..	7·54	58	1·34	11·34

Divisions and Stations.	Average Rainfall. Jan.	No. of Years' Records.	Total Rainfall. Jan. 1931.	Jan. 1930.
South Coast—continued:	In.		In.	In.
Nambour	9·91	34	11·58	20·28
Nanango	4·75	48	6·01	3·92
Rockhampton ..	8·34	43	3·24	26·59
Woodford	7·95	43	8·97	15·15
Darling Downs.				
Dalby	3·32	60	1·43	3·86
Emu Vale	3·31	34	1·15	1·32
Jimbour	3·65	42	2·19	2·31
Miles	3·78	45	1·27	2·31
Stanthorpe	3·62	57	1·65	2·08
Toowoomba ..	5·03	58	6·23	6·49
Warwick	3·58	65	1·98	2·03
Maranoa.				
Roma	3·26	56	1·24	1·53
State Farms, &c.				
Bungeworgorai ..	1·98	16	1·04	2·16
Gatton College ..	4·14	31	3·51	5·95
Gindie	3·74	31	4·39	6·83
Hermitage	3·31	24	1·68	1·56
Kairi	8·60	16	10·21	25·80
Mackay Sugar Experiment Station ..	14·34	33	4·12	28·94
Warren	5·22	15	..	14·16

GEORGE G. BOND, Divisional Meteorologist.

BUTTER MAKING FOR HOME CONSUMPTION.

IN the parts of this State where dairying is in general practice, it has become the custom to forward the cream raised on the farm to a butter factory, where the cream is received, treated, and manufactured into butter. To those supplying cream in this way to the factory, the process of manufacture of small quantities of butter on the farm is generally well understood. However, there is a number of persons scattered throughout the State who milk one or more cows, and have neither the desire nor the opportunity to tender the cream from the milk to a butter factory, but, on the other hand, they are anxious to make butter from the cream. Frequently, advice upon the procedure to be followed in so doing is sought from this office, and it is with the object of meeting inquiries of this nature that the subsequent simple particulars are supplied relative to the production of milk and cream, and the manufacture of the latter product into butter. The more important matters for observation will be referred to in their natural sequence.

Flavour.

Primarily it must be understood that the flavour of butter is influenced by—(*a*) the class of food to which the cows have access, (*b*) the degree of cleanliness practised in the handling of the milk and cream, and the skill exercised in the manufacture of the butter.

Many varieties of weeds and some useful fodders are capable of conveying objectionable flavours or taints to milk, and, in turn, the tainted flavour is noticeable in the cream, and ultimately the flavour of the butter is affected.

The tainting influence of fodders is minimised by feeding same to cows directly after milking, but not immediately preceding same.

Thorough cleanliness is necessary to prevent contamination of the milk or cream. The cow-bail and place where the cow is milked must have an impervious floor, and be kept in a clean and sweet condition. The udder, teats, and flanks of the cow should be washed and wiped prior to milking. The hands of the person who intends to carry out the milking should be cleansed similarly.

The milk should never be exposed to an impure atmosphere.

Strain the milk without delay after it is drawn from the cow by running it through a very fine-mesh gauze or, preferably, through a strainer fitted with a wad of sterilised cotton.

The milk should next be passed through a separator, or set in dishes to allow it to cream, the separator proving by far the more satisfactory means of obtaining the cream. If setting of the milk in dishes has to be resorted to, it will be found that shallow dishes, which provide a comparatively large surface for the cream to gather upon, are more satisfactory than deeper vessels with a limited surface.

Generally the milk is allowed to sour, or even coagulate, before the cream is skimmed off, but no more cream can possibly rise to the surface after the milk has thickened. The layer of cream is removed with the aid of a utensil termed a "skimmer," the customary makeshift being a tablespoon. The objective should be to collect as much cream as possible, but to avoid gathering any of the milk with it.

The cream should be placed in an enamelled vessel and should be kept as cool as possible. It must not be brought into contact with a tainted atmosphere, for the cream readily absorbs odours from such a source.

It is advisable not to mix the cream obtained by individual skimmings, or separations of the milk, until some hours before churning time, when the whole of the cream available for churning should be placed in one receptacle and allowed to ripen uniformly. Always avoid the mixing together of hot and cool cream.

A certain amount of lactic acid should be permitted to develop on the cream before churning, and this usually requires from thirty-six to forty-eight hours, according to the care taken and the temperature at which the milk and cream are held. Holding either milk or cream at comparatively high temperatures expedites the development of the acidity.

Temperature.

Generally natural temperatures in Queensland, particularly during the warmer season of the year, are too high to give satisfactory results in the churning of cream, and to remedy this difficulty artificial cooling of the cream by the aid of an ice-chest is advantageous. The water used for butter-washing purposes may be placed in a vessel and similarly cooled in the ice-chest. A more primitive means of cooling the cream is to stand the vessel containing it in water drawn from an underground well or spring; another method is to make a canvas jacket to cover the vessel holding the cream, and to arrange that the edges of the canvas covering reach a supply of water, which is drawn up by capillary attraction, and acts on the same principle as the cooling of water in a water-bag.

Usually good results in churning are obtainable by having the cream at a temperature of 56 degrees to 58 degrees Fahr. during the cooler months of the year, and reducing the temperature of the cream preparatory to churning several degrees lower throughout the warmer season.

Dairy Requisites.

In butter-making there are certain requisites and appliances that must be provided, even in cases where primitive methods are practised. Firstly, an ample supply of both hot and cold water must be available. The cold water is necessary for the purpose of washing the butter, and the hot water is required for use in cleansing and scalding the dairy utensils.

The water may be drawn from either a tank or well supply, provided it is wholesome. What is known as "hard" water from a well supply may be employed for washing the butter, so long as this condition of the water is caused by the presence of salt or limited percentages of other mineral matter not injurious to health. Water containing decayed vegetable matter should not be used for washing butter.

To recover the cream from the milk, either milk setting-pans or a separator is required. The setting of milk in pans to allow the cream to rise is not to be viewed as a satisfactory or economical method of recovering cream from milk. In the first place, there is the risk that the surface of the milk will catch a deal of fine dust particles from the atmosphere while awaiting for the cream to rise; another disadvantage is, that a large percentage of the butter-fat content of the milk is not recoverable by this method. A small-sized separator provides by far the more advantageous means of recovering the butter-fat from milk. Separators of a wide range in skimming capacity are procurable, and one should be secured of a capacity in agreement with the complement of milk to be treated.

A churn is necessary. There are many types of churns that have been designed to meet the requirements of those who desire to churn, for their own use, small quantities of cream. Generally, all are capable of churning satisfactorily. For convenience the churn should be simple in construction, durable, and so designed as to be readily cleansed.

Two butter pats for use in working and salting the butter should be provided.

Hand power butter-workers are procurable on the market, but such appliances (while admittedly most serviceable) are more suited to cases wherein the operations of the butter-maker are carried on in a comparatively large scale. In instances where it is intended to manufacture sufficient butter to satisfy the requirements of a family, the two pats are to be made to perform successfully the working and patting of the butter. This process can be carried out in a clean shallow dish if so desired.

A dairy thermometer is a most useful article, and should be included in the equipment of the dairy; and by its aid the temperatures of cream or water may be determined from time to time.

Churning.

Churning is simply a mechanical process for bringing together the butter-fat globules in the cream in order to make them coalesce or unite. Preparatory to the churning of cream, the utensils used in connection with the process should be dipped in scalding water and then rinsed in clean cold water.

The whole of the cream from the various skimmings or separations of the milk (that should have been cooled and mixed in a container for some hours prior to churning time) is placed in the churn and the churn is put into operation.

If the churn is of a design that allows the operator to view the cream while churning, it will be noticed that, after some little time under the churning process, the cream will assume a paste-like consistency and possess a smooth texture. At a later stage the cream will appear to increase in density, and subsequently the texture will appear gritty. This gritty appearance of the texture of the cream is occasioned by the unison of the fat globules, and indicates that the churning is nearing completion. Care should be taken at this stage that no cream is allowed to remain stationary on the sides of the churn, and any cream attached thereto should be removed and brought under the influence of the "paddles" of the churn with the main bulk of the cream. Otherwise a portion of the cream will remain unchurned, and be carried away and lost with the butter-milk.

As soon as the cream "breaks," it is advisable to add a small quantity of cold water to flush the sides and paddles of the churn, using about half a pint of water to each quart of cream in the churn. Carry on with the churning process until the globules gather in particles about the size of a grain of wheat. Now stop the churning and allow the butter to float upon the butter-milk, which should then be drawn off. In the case where the temperature of the cream is higher than it should be for correct churning, the butter-fat fails to assume a granular appearance, but gathers rather in the form of a mass of soft fat. However, this does not call for any change in the procedure in so far as the draining off of the butter-milk is concerned. When this is done, add wash water to the churn, and wash the butter, working the butter with the pats in order to eliminate the butter-milk as thoroughly as possible. The temperature of the wash water should be several degrees below that specified for the cream. It is well to remember that the incorporation of an excessive amount of butter-milk in the butter will result in the keeping properties of the latter being prejudicially affected.

In some cases a second washing of the butter is advantageous, but this is dependent upon the degree of success attained in removing the butter-milk in the first washing. After the washing of the butter has been effected, add fine salt to the butter in the proportion of from three-eighths to half an ounce of salt to each pound of butter.

Work the butter steadily with the pats, taking care not to injure the grain of the butter more than is necessary in expelling the excess of moisture. The working also mixes and incorporates the added salt with the butter.

If the churning of the cream has been carried out efficiently and correct temperatures observed and the butter properly washed, the moisture showing in beads on the finished article will be in the form of a crystal clear brine.

The butter is now ready for use, but as it is capable of absorbing odours given off by other strong flavoured foodstuffs, it should be stored away beyond attack from such influences in clean surroundings and kept as cool as possible.

ACIDITY IN MILK AND CREAM.

By CHAS. McGRATH, Supervisor of Dairying.

ACIDITY in milk is attributable to two causes:—

1. The presence in milk of acid phosphates and perhaps carbon dioxide. When freshly drawn milk gives an acid reaction to phenolphthalein it is owing to the presence of such substances.

2. The presence of lactic and other acids produced by the decomposition of the milk sugar by bacterial action. Lactic acid is not present in freshly drawn milk. It is developed at a later period and its development is influenced chiefly by the temperature at which the milk is kept.

Cooling milk to a temperature below 50 degrees retards the development and multiplication of bacteria responsible for the decomposition of the milk sugar and the production of lactic acid.

In dairy factory procedure the total acidity of milk is calculated as lactic acid.

The principle upon which the determination of acidity is based is the well-known chemical action of acids upon alkalies.

The exact point of neutrality is determined by the use of an indicator "Phenolphthalein" an organic compound having the property when in solution of turning pink with alkalies and remaining colourless with acids.

ACIDITY REDUCTION TABLE FOR CREAM.

Basis of Table:—·093 lb. soda bicarb. neutralises ·1 per cent. of acid in 100 lb. cream.

PERCENTAGE OF REDUCTION DESIRED.

BICARBONATE OF SODA REQUIRED IN POUNDS AND OUNCES.

..	·02	·04	·06	·08	·10	·12	·14	·16	·18	·20	·22	·24	·26	·28	·30	·32	·34	·36	·38	·40	·42	·44	..
lb. cream.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. cream.
50	0 0	0 0	0 0	0 0	0 0	0 1	0 1	0 1	0 1	0 1	0 2	0 2	0 2	0 2	0 2	0 2	0 2	0 3	0 3	0 3	0 3	0 3	50
100	0 0	0 0	0 1	0 1	0 1	0 2	0 2	0 2	0 3	0 3	0 3	0 4	0 4	0 4	0 4	0 5	0 5	0 5	0 6	0 6	0 6	0 7	100
200	0 0	0 1	0 2	0 2	0 3	0 4	0 4	0 5	0 6	0 6	0 7	0 7	0 8	0 8	0 9	0 10	0 10	0 11	0 11	0 12	0 12	0 13	200
300	0 1	0 2	0 3	0 4	0 4	0 5	0 6	0 7	0 8	0 9	0 10	0 11	0 12	0 13	0 13	0 14	0 15	1 0	1 1	1 2	1 3	1 4	300
400	0 1	0 2	0 4	0 5	0 6	0 7	0 8	0 10	0 11	0 12	0 13	0 14	0 15	1 1	1 2	1 3	1 4	1 5	1 7	1 8	1 9	1 10	400
500	0 1	0 3	0 4	0 6	0 7	0 9	0 10	0 12	0 13	0 15	1 0	1 2	1 3	1 5	1 6	1 8	1 9	1 11	1 12	1 14	1 15	2 1	500
600	0 2	0 4	0 5	0 7	0 9	0 11	0 12	0 14	1 0	1 2	1 4	1 5	1 7	1 9	1 11	1 13	1 14	2 0	2 2	2 4	2 5	2 7	600
700	0 2	0 4	0 6	0 8	0 10	0 12	0 15	1 1	1 3	1 5	1 7	1 9	1 11	1 13	1 15	2 1	2 3	2 5	2 8	2 10	2 12	2 14	700
800	0 2	0 5	0 7	0 9	0 12	0 14	1 1	1 3	1 5	1 8	1 10	1 13	1 15	2 1	2 4	2 6	2 8	2 11	2 13	3 0	3 2	3 4	800
900	0 3	0 5	0 8	0 11	0 13	1 0	1 3	1 5	1 8	1 11	1 13	2 0	2 3	2 5	2 8	2 11	2 14	3 0	3 3	3 6	3 8	3 11	900
1000	0 3	0 6	0 9	0 12	0 15	1 2	1 5	1 8	1 11	1 14	2 1	2 4	2 7	2 10	2 13	3 0	3 3	3 6	3 9	3 12	3 14	4 1	1000
2000	0 6	0 12	1 2	1 8	1 14	2 4	2 10	3 0	3 6	3 12	4 1	4 7	4 13	5 3	5 9	5 15	6 5	6 11	7 1	7 7	7 13	8 3	2000
3000	0 9	1 2	1 11	2 4	2 13	3 6	3 14	4 7	5 0	5 9	6 2	6 11	7 4	7 13	8 6	8 15	9 8	10 1	10 10	11 3	11 11	12 4	3000
4000	0 12	1 8	2 4	3 0	3 12	4 7	5 3	5 15	6 11	7 7	8 3	8 15	9 11	10 7	11 3	11 14	12 11	13 6	14 2	14 14	15 10	16 6	4000
5000	0 15	1 14	2 13	3 12	4 10	5 9	6 8	7 7	8 6	9 5	10 4	11 3	12 1	13 0	13 15	14 14	15 13	16 12	17 11	18 10	19 8	20 7	5000

TRACTOR SCHOOL AT GATTON.

The Queensland Agricultural High School and College, in conjunction with the Council of Agriculture, will hold the eighth Queensland tractor school from the 31st March to 10th April inclusive.

The course will cover lectures, demonstrations, and practical work in the care, adjustment, repairs, and driving of many makes of tractors.

At the last school there were present the following tractors:Caterpillar (10-14 h.p. and 15-20 h.p.), Massey-Wallis (12.20 h.p. and 20-30 h.p.), Case (model C and model L), Fordson (1930 model), McCormick-Deering (10-20 h.p.), Cletrac (30-48 h.p.), Twin City (17-28 h.p.), Stock (16-28 h.p.), Lanz (20 h.p.), Auto Rotary Cultivator, British Wallis (15-25 h.p., college owned), Cletrac (12-20 h.p., college owned), two Fordsons (college owned).

The cost to each farmer will be £3 9s. 6d., which will cover all instruction costs, board and residence, and recreation fee.

The Railway Department will grant attending farmers one-half excursion rates each way on presentation of a certificate from the college.

The college will provide power kerosene, the railage on tractors from and to Brisbane, and free board and residence for tractor mechanics.

Farmers should book to College Station and ask the guard to stop, previously advising the college of the train by which they will travel.

Farmers will need to bring blankets, sheets, mosquito nets, pillow slips, towels, soap, mirror, and other toilet requisites.

No farmer will be allowed to confine his attention to a particular tractor, but must work each in turn. Should he desire more work on a particular tractor he will have to arrange it in his spare time.

Applications from farmers wishing to attend the school will be received from now onwards; early applications will be given preference.

Any further particulars will be supplied on request.

FRUITGROWING IN NORTH QUEENSLAND.

Mr. H. F. Walker, Secretary for Agriculture and Stock, has received the following report (28th January, 1931) from Mr. H. J. Freeman, Senior Instructor in Fruit Culture, Cairns, on the position of the Fruit Industry in the North during the past few months.

IN almost every citrus orchard a very heavy crop has set, and if no setback is received from weather conditions, large consignments will be handled when this fruit matures. Spraying is very necessary, and unfortunately those who have not already taken this precaution will be given very little opportunity during the next few months, for the recognised wet season of North Queensland is almost at hand.

Both smooth and rough varieties of pineapples are very much earlier maturing in the North compared with the South. Brisbane market prices have apparently been too low to entice the forwarding of large consignments from the Northern centres, consequently most growers are trusting to local sales. Most of the rough variety are on the small side, due largely to the fact that the plantings are somewhat old.

Papaws, granadillas, and passion fruit are grown for local markets mostly, and at present are rather scarce.

Tomatoes are scarce owing to the growers endeavouring to cultivate this crop without spraying systematically.

The bulk of the mango crop in the North is collected from the few trees to be found round almost any farm-house throughout the North, mostly of different varieties, but in nearly every instance each variety could be improved. All the crop has been harvested, excepting around the Cardwell district.

Bananas are commanding a better position in the North and, from reports to hand, some fine fruit is being railed South. Local consignments are heavy, and prices are somewhat light. The fruit shipped to the South during October and November should have proved profitable to the senders, judging by the good returns to hand. December was rather a poor month for bananas owing to the quantity of temperate fruits coming forward. The Russell River banana area is easily the pick of the Northern districts, and by the end of next March some excellent consignments will have been recorded.

The North from a fruitgrowing point of view is creeping ahead, bananas and pineapples making the main foundation. Largely responsible for this movement is the opening of the Kyogle line and the weekly boat leaving Cairns and Townsville, thus making fast transport by either rail or sea to southern markets. The suitable weather over the past three months was an appreciable factor in the general progress.

Prospects of the Northern fruit industry depend for advancement on speedy, sure, and cheap transport to both the Southern and Queensland markets. In addition to this, three serious pests and diseases must be controlled—rust, leaf spot, and fruit fly.

The quality of the fruit produced is quite satisfactory, and there are large areas of land available for profitable horticulture, subject, of course, to adequate pathological control.

The progress over the past three months at the Bartle Frere Experiment Station is quite satisfactory. When once the plants at present growing in the nursery area (25,000) have been removed, conditions will greatly improve and a fine area of land for experimental purposes will be available. In the bananas trapping for beetle must be continued, and spraying the bunches for thrip every three weeks is necessary to keep the fruit clean. Netting all bunches against fly is an absolute necessity to ensure one against trouble from this pest.

ABSTRACTS AND REVIEWS.

"AGRICULTURAL RESEARCH IN 1929."

Royal Agricultural Society of England. 182 pages. Price, 1s. 3d.

The fifth volume of this annual summary of scientific and economic research work in agriculture, covering investigations conducted not only in Britain but abroad, in so far as dominion and foreign results are of interest to agriculturists, is now to hand. Started five years ago at the instance of the Research Committee of the Royal Agricultural Society, quite frankly as an experiment, the publication has now established for itself a definite place in the periodical literature of the farming industry. Farmers are naturally at a disadvantage not only in interpreting the results of scientific work but also in knowing where to look for them. They appear in periodicals not always accessible to the farmer and couched in language not always easily understood by him. His work lies around him on his farm; he has neither the time nor always, in these days, the means to study a multiplicity of journals and pamphlets, and thus it happens that the results of research work are often too slow in reaching those who are most concerned to know about them. Collected from all available sources, put together by acknowledged authorities, in non-scientific language, the contents of "Agricultural Research" should be studied by all those who wish to keep themselves abreast of the times in modern agricultural practice.

It is impossible to do more than to give some indication of the subjects dealt with in the new issue. In the section on "Crops and Plant-breeding," Professor Engledow has provided an interesting summary of the development of winter washes for fruit trees derived from tar oil. The way in which these washes act as destroyers of eggs of injurious insects is still uncertain, but of their effectiveness as winter washes there is no doubt, and their use may even dispense with the necessity for spring spraying in some orchards. For the arable farmer there are useful articles on varieties of sugar beet, and on the control of rust and smut disease of cereals. Mr. Mackintosh deals with questions of interest to the dairy farmer, and milk producers will give special attention to the section of his article on "Dairy Husbandry," dealing with the intensive manuring of grass land, even though it may require a good deal of courage in these days to lay out money on the intensification of production. The economic aspects of milk production are considered also in Mr. Orwin's article entitled "Agricultural Economics," where the question of the utilisation of surplus milk is discussed. In these days of low prices and high costs the question of the use of machinery on the farm is one of increasing importance, and some figures are given of cultivation costs with the use of a tractor, which farmers may compare profitably with their own horse labour costs. Following on the same subject, farmers should find much of interest to them in Dr. Owen's article on "Agricultural Engineering."

As in past years, Sir John Russell's notes on "Soils and Fertilizers" form one of the most important sections of the volume. It is satisfactory to read that the production of artificial fertilizers, particularly of nitrogenous manures, continues to expand, and in spite of economic difficulties, it seems that the cheapness of chemical fertilizers is making them increasingly attractive to farmers.

An article on "Veterinary Science," by Dr. F. C. Minett, Director of the Research Institute in Animal Pathology, deals with many matters of primary importance to the practical farmer. Amongst these, further experience is recorded of progress in combating that scourge of the cowkeeper, contagious abortion.

For the assistance of students and others desirous of consulting original sources of information, each section of "Agricultural Research" concludes with a complete bibliography of papers quoted. The Royal Agricultural Society of England, it should also be noted, is continuing the sale of the volume at the reduced price of 1s. 3d., in order to secure the widest possible circulation. The society's London address is 16 Bedford square, London, W.C.1.

UNPRODUCTIVE CITRUS TREES.

By H. BARNES, Instructor in Fruit Culture.

INQUIRIES are from time to time received from citrus growers in various parts of the State seeking the reason for the infertility of their trees, particularly Scarlet Mandarins. In the vast majority of cases the same answer can confidently be supplied—the trees have been propagated from an unprofitable source, i.e., they have been budded or grafted with wood taken from a shy-bearing tree. On the theory that "like begets like," it naturally follows that trees worked with wood from unproductive trees will themselves be unproductive.

An illustrative incident of this condition in Scarlet mandarin trees has lately been under observation on Mr. Karhula's orchard at Runcorn. The trees, which are about twelve years old, are growing in a light red sandy loam on the crown of a gentle rise. Mr. Karhula purchased the orchard several years ago as a going concern, and it was then in a somewhat neglected condition. Up to that time the trees were reported to have borne only one good crop, though it is extremely doubtful if this were true. Each year since taking over the orchard Mr. Karhula has endeavoured by means of intensive cultivation and heavy applications of artificial manures to bring the trees into bearing, but although they blossom profusely, very little fruit sets. Orange trees growing on an adjacent block responded freely to similar treatment, and continue to bear good crops.

Early in September last, when the trees were in blossom, an inspection was made and a slight abnormality was noticed in the flowers. They did not appear to expand as much as usual but seemed rather constricted. Having in mind the possibility of the presence of parasitic growths, it was decided to dust three trees with precipitated sulphur. On the advice of Mr. Mandelson, of the Pathological Branch of this Department, it was also decided to spray three other trees with Bordeaux mixture, leaving a check row between. This was done on three occasions with an interval of ten-days to a fortnight between each operation. As a further experiment the trunks of two trees and several main branches of each of a number of other trees were cinctured shortly after the petals began to fall. Early in the season it appeared as if the order of things was to be reversed, and that all the trees would set a good crop, due no doubt to a good early spring.

As the summer advanced, however, and conditions became drier, the young fruit began to fall, and it soon became apparent that this was to be but a repetition of previous seasons. At the end of January in many of the trees it was difficult to find even a single fruit. The trees which were sulphured showed no benefit, whilst those which were sprayed with Bordeaux mixture showed, if any, only a very slight improvement. The trees and branches which were cinctured, however, showed up remarkably in comparison, as they had without exception set a very good crop. Where the two or three main branches forming on side of the tree were cinctured these were heavily laden with fruit whilst on the other side the fruit were few and far between.

A Natural Deduction.

The natural conclusion to be deduced from this evidence is that the fault lies in the constitution of the trees themselves, and since they have failed repeatedly to respond to cultivation and fertilizing, the only remedy that remains is to cut them back and work them over with wood from trees of proved value.

Remedy and Methods.

The method adopted in working over-grown trees of this nature is to remove the head of the tree during the winter when the tree is dormant by cutting back all branches to within 2 to 5 feet of the trunk, according to the size of the tree, and leaving only what is required to form a new head. During the spring numerous shoots will start from the branches remaining, and these may be thinned out after the first growth has hardened to three or four suitably place near the end of the shortened branch. Later these can be reduced to two. When the shoots are about 6 inches long the terminal growths should be nipped out to lessen their chances of being blown off by the wind, and also to "stiffen" the growth. During the following autumn the trees will be ready for budding, or they may be left until the spring. Trees worked over in this manner will carry a crop of fruit two years after working, and will rapidly attain the same dimensions as the original tree.

In some publications it is recommended that in heading back trees at least two branches be allowed to remain to act as draw branches to maintain the vitality of the tree. This may be necessary provided heading back is done at a period when the tree is in growth or during the wrong time of the year, but when the shortening is done during the winter, when the growth has terminated, the whole of the top may be safely removed without fear of the tree dying back; in fact, better results can be obtained when no "draw branches" are left, and the future shape of the tree can be more readily formulated.

The method of cincturing a tree (or ringbarking as it is sometimes called) is to entirely ring the tree through the bark with an ordinary pruning saw without injuring the cambium layer or the wood underneath. It is just as important that the bark be entirely cut through all the way around as it is not to injure the cambium. The idea is to check the flow of sap, and if the operation is performed at the right time—that is, about ten days to a fortnight after the petals of the flowers begin to fall—it enables the tree to set and hold its fruit better. In the case of a hollow or depression in the trunk of a tree which cannot be reached with the saw, the bark may be taken out to the same width as the saw cut with a pruning knife. The wound will soon heal over leaving only a very slight narrow scar.

FERTILISER TRIALS AT ELIMBAH.

PINEAPPLES AND CITRUS.

By H. BARNES, Instructor in Fruit Culture, Brisbane.

PINEAPPLE PLOT.

Drainage.—Reference was made in a previous report that a portion of the plot required draining and that the effect of the excessive moisture round the roots of the plants was reflected in the growth. This defect has now been rectified. During September, under personal supervision, 500 ft. of 3-in. agricultural pipes were laid at a depth of 3 ft., comprising a main and four side drains. Owing to the long-continued spell of dry weather up to December, no appreciable result has been noted in the growth of the plants under the influence of the drain, but now that the wet season has set in its effect will be interesting to record.

The application of the fertilizer mixtures set out in the following table were made in April and October, 1930, and so far as healthy colour and even growth and general appearance is concerned, row No. 2 is by far the best. The plants were not large at the time of inspection, but were growing well and there had been a marked change showing the benefit of the change over from Nauru phosphate alone under which the results were poor. The number of the fruit in the row was low, but should be very much better next season.

Row No. 7 (potash only), which in the previous report was the best, had lost its premier position. Though the plants were strong and fruit good, the foliage was pale, indicating lack of nitrogen.

Rows planted through paper mulch were generally sturdy plants and were much improved. One row, No. 3, had the highest number of fruit (136).

One noticeable feature was that rows to which blood had been applied showed much long, narrow sword-leaf growth. On appearances its application, at least in large amounts, is not to be recommended.

PINEAPPLE FERTILISER EXPERIMENTS AT ELIMBAH.

PLOT—FOURTEEN DOUBLE ROWS, 9 FT. (CENTRE TO CENTRE) APART, 50 YARDS IN LENGTH.

Row No.	Nauru Phos.	Sulp. Amm	Sulp. Potash.	Blood.	Basic Super.	Bone.	Previous Remarks.	Present Condition.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.		
*1	..	..	..	..	..	..	Poor growth ..	Fairly strong plants; pale colour; growth fair. Number of fruit, 119.
2	15	10	10	..	..	..	No improvement..	Good even growth; colour very good and best in plot Plants somewhat small though growing well and showing benefit of change over from Nauru alone. Number of fruit, 21
†3	24	..	..	14	..	..	Fairly good growth; pale foliage	Sturdy plants; growth fair; pale foliage. Best row for fruit, 136
4	..	..	..	20	..	..	Good colour; growth moderate	Growth variable; some long narrow sword-leaf growth; colour fair. Fruit, 79
5	..	10	16	10	..	..	Rather pale; fair growth	Growth very uneven; spindly narrow leaves; colour fair. Fruit, 52
†6	..	10	10	..	15	..	Pale; poor ..	Paper mulched; growth improved; colour good; somewhat uneven growth. Fruit, 52
7	..	..	20	..	..	..	Best row; good growth; fair colour	Good strong even growth; foliage very pale. Fruit, 88
8	..	..	18	18	..	..	Fair growth; good colour	Fair growth; some spindly plants. Colour generally good though variable with condition of plants. Fruit, 77
†9	16	..	18	14	..	..	Variable; very fair to good	Sturdy plants and good growth; colour fair. Fruit, 116
10	..	..	20	18	10	..	Fair growth and colour	Growth variable; fair to good; long narrow sword-leaf foliage. Fruit, 74
11	..	18	20	..	10	..	No improvement on 10	Colour slightly better than 10 and growth similar. Fruit, 49
†12	..	..	20	16	..	14	Poor	Fairly strong growth; colour good, growth uneven. Fruit, 74
13	..	{.. §10}	{‡30 §10}	..	..	..	Weak growth ..	Weak growth; colour good. Fruit, 77
*14	..	..	..	..	..	..	Poor	Poor. Fruit, 40

* Check Row. † Paper Mulched. ‡ Applied in April. § Applied in October.

CITRUS PLOT.

Complete fertilizers were applied to some trees, whilst nitrogenous manures only were given to others. At the time of inspection all the trees were looking very well and holding good crops of fruit. Comparative figures will be available later when the crop has been harvested.

SATISFIELD WITH THE JOURNAL.

A Bowen, farmer writes (27th January, 1931):—"I am enclosing my subscription for the 'Queensland Agricultural Journal' for two years, as I consider it's the best money's worth in the Commonwealth for a farmer."

Answers to Correspondents.

Yeast in Cheese.

Inquirer—The Supervisor of Dairying, Mr. Chas. McGrath, advises:—

The development of yeast in milk and cheese is due to outside contamination and is difficult to avoid, particularly during hot weather. The yeast oxidises the lactic acid and creates conditions suitable for the development of putrefactive bacteria. The use of a pure lactic culture will be of service to cheese-makers. Care in the preparation and handling of the culture is essential in order to secure the benefits to be derived from its use. Starter cans and all other dairy utensils used in the preparation of the culture should be thoroughly cleaned, and sterilised by covering them with water kept at boiling for at least fifteen minutes.

Orange and Lemon Juice Preservation.

Replying to an inquiry, the Agricultural Chemist, Mr. J. C. Brünnich, advises:—

The preservation of orange and lemon juice is a very simple matter and presents no difficulties whatsoever. Concentrating such juice is quite out of the question because it involves vacuum pans, machinery, &c., which would only be used for a few months of the year. From information supplied by the manager of the C.O.D. no orange juice is imported from abroad, and the importation of Southern products could only be prevented if a health regulation prohibited the use of preservatives in such cordials. It is impossible to keep such products with certainty in barrels or other open containers without preservatives, but if kept in bottles or sealed containers the juices could be kept indefinitely for years. We ourselves preserved pineapple juice which was kept ten years, without any preservatives, and was of excellent quality and fresh flavour when opened. Any fruit juice can be kept indefinitely by a process of repeated pasteurisation, which simply means bottling or tinning the sterilised juice whilst hot and repeating the heating up to about 160 or 180 deg. Fahr. twice after sealing the containers after twenty-four hours intervals.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

White Sapote.

G.B.B. (Rockhampton)—

The specimen is the White Sapote (*Casimiroa edulis*), a native of Mexico and Central America. There are several named varieties, for the cultivation seems to have increased in recent years. The pulp is creamy but varies from very sweet in some varieties to rather bitter in others. The tree belongs to the family Rutaceæ and is not really related to the other Sapotes. The Aztec name for the fruit was Cochiztzapotl, the Sleep-producing Sapote. It is also known in Central America as Metasano or Kill Health, but there seems to be no foundation whatever for these names, and the cultivation of the fruit is now on the increase.

Cape Cotton.

C.P.R. (Gordonvale)—

The specimen is *Gomphocarpus fruticosus*, the Cape Cotton or Balloon Cotton, a native of South Africa now naturalised in many parts of the world. In Queensland it is sometimes grown as an ornamental plant, but is apt to become a pest; in fact, in some localities such as scrub farms between Brisbane and Gympie on the North Coast line it has over-run the country here and there to the exclusion of other plants. The bladder-like fruits contain a silk-cotton, but this has no value as a true cotton, but has some value as a kapok, though its collection for this purpose would hardly be a payable proposition. The stems contain a fibre, however, which might be put to commercial use.

The Young Farmer.

YOUNG FARMERS' CLUBS.

On his return from a visit to Great Britain recently, Mr. Philip Frankel, a councillor of the Royal National Agricultural Association, Brisbane, and a prominent Queensland business man, indicated that, while overseas, he was specially interested in junior farmer clubs and in the junior judging competitions. He favoured the scrapping of the present system of conducting judging competitions and substituting the English method, believing that the latter would be much more adaptable to conditions here. In discussing the junior farmer clubs, he explained that these clubs have been initiated for the purpose of giving young people a desire for knowledge of national things. They aim at providing training in stock raising of all kinds and in other branches of agriculture, in public speaking, and in the management of affairs generally. The members look after something which lives and grows, either animal, bird, or plant; and the living thing is made the basis of club activities which are designed to be educative as well as interesting. The types of stock kept by the club members in Great Britain include calves (dairy and beef), pigs, poultry, rabbits, and bees; as well as horticulture. As far as possible, the clubs are run by the members, assisted by grown-ups with special knowledge, who act as an advisory committee. The clubs have proved to be of very real value, tending to develop self-reliance.

In urging an extension of the junior farmer movement, Mr. Frankel indicated how boys might be equipped and encouraged to take up land for themselves, making them a national asset and better citizens, instead of seeing so many drift into the ranks of the unemployed.

[The junior farmers' clubs already initiated in Australia have proved of immense value in the direction indicated and an extension of them is highly desirable.—ED. "Q.A.J."]

POINTS FOR PIG CLUB MEMBERS.

IN a recent address to a gathering of children and adults, Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising, dealt with various attributes in Home Project Club membership and reminded his hearers that if success were to be attained it would only be through true co-operative effort and sympathetic interest. To succeed in any scheme it is essential that the club member has faith, not only in his or her ability to carry the work through, but in the ability of the other members of the club to co-operate. It is just as essential to have faith in others as in one self and it is necessary to have faith in the club organisers and in the scheme generally if best results are to be obtained.

The objective of the scheme is "to make the best better" and to teach certain definite lessons in practical agriculture. Before a commodity is produced some study should be given to the requirements of the consumer of that article and to the demand that exists or that can be built up. The law of supply and demand requires attention, though perhaps not so much from the point of view of the junior as from the senior farmer. There is a limit to the consumption of any product, and one of the lessons to be learned is as to how far farmers can safely go in the production of different products on the farm.

Overseas trade is capable of absorbing immense quantities of Australian products, but only at a price, hence one of the most important of the lessons taught is how commodities can be produced at a rate allowing of profitable disposal on overseas markets. Consumers' demands there, as well as here, are subject to fluctuation and careful attention must be given to these demands.

Years ago it was the common practice to market beef cattle at heavy weights and at six and seven years of age; these heavy grades are not now in demand, and the two-year old beast is the most profitable.

Heavy-weight, fat pigs were extremely popular and profitable twenty years ago, but are now a drug on the market and cannot be disposed of profitably; and so it is in other lines, hence, a study of the consumers demands is highly profitable. Costs of production, if they can be ascertained at all, need careful study, for it is certainly essential to reduce these costs to a minimum in order to reap additional profits. There are ways and means of creating additional demands, as was well known to Henry Ford when he commenced manufacturing motor-cars, and we have yet a great deal to learn in the direction of popularising our own products and building up additional market outlets. The fruit trade has learned that it pays to put on an "Eat More Fruit Campaign," just as the motor-car people advise the purchase of new and better motor-cars.

Climatic conditions and environment needed careful consideration in the development of agricultural projects, for there are certain districts in which one project will be much more successful than in others. As the population increases so both production and consumption increases and these matters are well worth careful study.

It is essential to learn the good points as well as the defective ones in all branches of stock raising. The only profitable demand is for early maturing, prime quality attractive trade lines, hence a study of trade classification becomes a necessity. There is no profitable demand for bruised, damaged, or otherwise abnormal carcasses in the meat trade, or for fruit or other products in an unmarketable condition. The by-products of the live stock industry are important, yet their value fluctuates considerably and it is essential to study these questions. In every direction there were points of interest and though all could not be learnt in one year, there is no reason why the junior farmer should not become conversant with them all.

"TO MAKE THE BEST BETTER."

The ambition of every 4 H club member in America, no matter in what project he or she may be working, is "To make the best better"; indeed this is their national club motto and is the goal towards which each member continuously aims.

Their club emblem is a four-leaf clover, in the centre of each leaf the letter H being woven, these letters representing Head, Heart, Hands, Health, all of which have their own special job in the building up of a strong, active, healthy membership. The head to plan and think out the various schemes; the heart to put them into operation and to maintain loyalty to club, community, and country; the hands to faithfully carry out the work thus planned and initiated; and the health to do the work to the best of the member's ability.

Up to the present no such club motto or club emblem has been adopted nationally in Australia, for the reason that each State has its own separate scheme and the keen rivalry existing between the different States has tended towards each adopting its own particular project.

It would be an advantage, however, if some acceptable scheme could be brought into operation, especially now that it is recognised there are advantages in an interchange of ideas and co-operation in carrying into effect such schemes as Farm Boys' Camps at State Royal and Royal National Shows, and it is hoped the time is not far distant when there will be some further co-operation between the States in the endeavour to build up a strong national project scheme into which State barriers have no entry.

One can imagine what chaos would exist if every State in America attempted to work out its own scheme without reference to any Federal plan; it would be just as disastrous as an attempt at State Government as opposed entirely to Federal control in a country where there are so many individual States.

To make the best better, therefore, should be the objective in the higher sense, and from the national point of view is just as important and necessary as it is in the case of individual projects.

It is satisfactory meanwhile to note that the club movement is growing and to know that every year brings us a greater and wider membership with better work, more consistent interest and with much more satisfactory financial returns. There is a great future before the Home Project (Club) Scheme in Australia.

General Notes.

Sanctuary for Animals and Birds at Bowen.

An Order in Council under the Animals and Birds Acts has been issued declaring Muller's Lagoon, Bowen, to be a sanctuary in which it shall be unlawful for any person to take or kill any animal or bird. The full description of the lands in question is:—Portion 149, county of Herbert, parish of Pring, being a reserve for Lands Office paddock as proclaimed in the "Government Gazette" of the 30th May, 1914, folio 1395, having an area of 59 acres 1 rood 26 perches.

Extension of Cotton Board for Five Years.

The Queensland Cotton Board was constituted in 1926 for a period of five years which expires on the 31st December, 1931. On the 4th December, 1930, an Order in Council was issued giving notice of intention to extend the Board for five years from 1st January, 1932, until the 31st December, 1936; the closing date for the receipt of a petition for a poll to decide whether or not the Board should be extended was the 5th January, 1931, and as no petition was received by that date and in accordance with the provisions of the Acts, an Order in Council has now been issued extending the operations of the Queensland Cotton Board for five years from the 1st January, 1932, to the 31st December, 1936.

Staff Changes and Appointments.

Mr. S. Wilson, Police Magistrate, Cloncurry, has been appointed Government Representative on the Cloncurry Dingo Board.

Mr. H. Hacker, Entomologist, Queensland Museum, has been appointed an Inspector of Stock and Plants.

The appointment of Mr. H. B. Ford as an Inspector of Stock has been confirmed from the 22nd April, 1930.

Acting Sergeant C. Cryan (of Cooktown) and Constable E. Brown (of Kynuna) have been appointed also Inspectors of Slaughter-houses.

The following have been appointed members of the Northern Pig Board for the year 1931:—Messrs. R. Campbell (Peeramon), D. Johnston (Malanda), R. T. Croker (Malanda), F. H. Hyde (Peeramon), H. T. Skennar (Malanda), and E. Graham (Director of Marketing). Mr. R. T. Croker has been appointed chairman.

Northern Cane Prices Boards.

The following persons have been nominated as Canegrowers' Representatives on the respective Local Boards against which their names are set, and as the number in each case exceeds the number to be elected a poll will be taken on the day fixed for same—viz., the 7th March, 1931—for the Goondi, Inkerman, Kalamia, Mount Bauple, Pioneer, and Tully Local Boards, closing in all cases at 3 o'clock in the afternoon of the above date:—

Goondi.—W. J. Burke, W. D. Davies, and R. Lecase.

Inkerman.—S. W. Gibson, W. F. Klaka, F. J. Woods, and E. E. Turnbull.

Kalamia.—M. A. Coyne, B. S. Donovan, W. H. Ferguson, H. A. Wellington.

Mount Bauple.—W. J. Douglas, H. Jeppeson, R. A. Maike, and P. B. Scougall.

Pioneer—B. S. Donovan, L. W. J. Hoey, and W. C. Smith.

Tully.—H. N. Lund, A. Ronan, and J. A. Winter.

Arrowroot Board Election.

Nominations will be received by the returning officer, Department of Agriculture and Stock, Brisbane, on or before the 10th March, 1931, for election as growers' representatives on the Arrowroot Board. Five such representatives are to be elected for a term of three years by those growers who in the 1930-1931 season supplied arrowroot bulbs grown in Queensland to any arrowroot mill in Queensland. Each nomination is to be signed by at least ten such growers. If more than five nominations are received a postal vote will be taken. Persons eligible to vote are invited to send their names and addresses at once to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Mackay District Cane Pest Board.

An assessment at the rate of 3d. per ton will be levied on every ton of sugar-cane received at the Cattle Creek, Farleigh, Marian, North Eton, Pleystowe, and Racecourse sugar works during the season 1931-1932, for the purposes of the Mackay Cane Pests Board. Such assessment is payable by the owner of the sugar works in the first instance, but such assessment shall be paid and borne by the owner of the sugar works and the grower of the cane, respectively, in equal proportions.

Control of "Newcastle" Disease of Poultry.

Regulations have been passed under the Diseases in Poultry Act designed to prevent the introduction of ''Newcastle'' disease of poultry, at present prevalent in Victoria, into Queensland. An Order in Council has been passed declaring ''Newcastle'' disease of poultry (pseudo poultry plague) to be a disease under the Act, and another has been passed declaring all finches, parrots, pheasants, and quail to be poultry under the meaning of the Act.

Regulations at present provide that poultry may only be introduced into Queensland on production of a declaration by the owner that such poultry are entirely free from disease and during the preceding three months have not been in contact with diseased poultry. Such declaration must be accompanied by a certificate from an inspector of poultry whence the birds have come, stating that he has examined them and has no reason to doubt the declaration. These regulations have now been amended to provide that, as well as producing the declaration and certificate as above, the owner of the poultry must also produce a certificate from the Chief Inspector of Stock or Chief Veterinary Surgeon in the State from which the poultry have come stating that there has been no outbreak of ''Newcastle'' disease in that State in the preceding twelve months, and that such birds are the product of such State or have been in that State for the last preceding twelve months. In addition, he must also deliver a permit to import issued by the poultry expert of the Department of Agriculture and Stock, Brisbane. In future, therefore, it will be necessary for any person desirous of introducing fowls, ducks, geese, turkeys, guinea fowl, pigeons, finches, parrots, pheasants, and quail from any other State of the Commonwealth into Queensland to produce the above declaration, certificates, and permit before being allowed to bring them into the State.

To Increase Dairying Profits.

As a means of increasing the margin of profit, greater production per acre should be the aim of every dairy farmer.

Feed regularly and plentifully. In addition to pastures, grow fodder crops, if possible, all the year round. Grow lucerne if possible, if only a quarter of an acre. During the autumn plant oats, vetches, wheat, barley, &c., and during the spring and summer grow maize, sorghum, saccaline, Sudan grass, &c. In addition to these, if you wish to get the maximum yield out of your cows, give them a little concentrated food, such as crushed oats, maize meal, bran (each two parts) mixed with lucerne chaff (eight parts).

Improve your pastures by top-dressing and the sowing of winter grasses and clovers. The pasture on land which has been used for dairying for a long period without any effort being made to return to the soil the mineral constituents which have been taken from it becomes deficient in such ingredients, and the animals that graze on it suffer. In most of our dairying districts there is need for a change of food from paspalum, which, in districts where frosts are experienced, produces little or no nourishing material in the winter. Better pastures mean healthier and more consistently productive cattle.

Divide your farm into small sections, say, of 10 acres each, and graze them off in rotation. Thus the cows have fresh, young pasture all the time, and their milk yields are increased.

Profit by the security afforded by a reserve of feed in the form of silage. The most convenient form of silo for the dairy farmer is the overhead type, but a stack silo is cheaply constructed, and where the soil is suitable a pit silo can be used. Silage is a good insurance against times of scarcity; it does not burn or deteriorate, and cows milk well on it.

Join a herd-recording unit. It is the most effective and cheapest way of getting at the yields of your cows. Put a pure-bred bull of known and recorded production strain at the head of the herd, keep his heifers out of the highest yielding cows, and as they come in cull out and sell to the butcher the low producers. It is wonderful how quickly the average yield of the herd goes up if it is managed on these lines.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE DISCOVERY OF VITAMINS.

LAST month we discoursed on the elementary chemistry of food. All that was then said was sound scientific truth, but it was not the whole truth. It is just this difference between the truth and the whole truth that the generality of mankind comprehend very imperfectly, if at all.

A few men, inspired by the real scientific spirit, endeavoured to increase their knowledge of diet by feeding small animals on extremely pure foods—carbohydrates, fats, and proteids—in sufficient quantity and varying proportions. These experiments were numerous and very carefully conducted. The results were always the same. The animals failed to develop properly, became badly nourished, and finally died. This discovery, together with the study of some previously ill-understood diseases—beri beri, scurvy, and rickets—led to the discovery of vitamins.

We do not yet know the whole truth about vitamins. There appears to be half a dozen of these necessary constituents of food; there may be more. They are present in very minute quantities in some foods only. Four of these vitamins are now well known, and for convenience are named vitamins A, B, C. and D. Very little is known of their chemical composition except in the case of vitamin D, and this is the only vitamin that has been made by artificial means. They are all present in varying proportions in some vegetable foods, and in some fresh animal foods such as milk and eggs. As the young animal lives exclusively on one of these last two foods, it follows as a matter of course that they must contain all the substances necessary for its nutrition and growth. In preserved foods they are frequently deficient or absent; absent also in the refined foods that are unfortunately preferred by those who have never been better taught.

Vitamin A is present in milk, cream, butter, eggs, and suet. It is deficient or absent in margarine, lard, and many vegetable oils. Liver and cod-liver oil are very rich in this vitamin, which is contained also in green vegetables and carrots. If his diet does not contain sufficient vitamin A your child will grow very slowly and will contract infections easily and recover from them with difficulty.

Vitamin B is present especially in the husks and embryos of cereals, and therefore in wholemeal bread, and in all foods made from whole grains. White flour, white bread, and polished rice contain none of this vitamin, which is very apt to be deficient in our diet. This is a probable cause of constipation, poor teeth, and a liability to infections. Vitamin B is readily supplied to the diet in the form of prepared bran, as a preparation of wheat embryos known as bemax, and in marmite, which is made from yeast.

Vitamin C is present in all fresh uncooked fruits and vegetables, but is easily destroyed by cooking. It is specially abundant in the juice of oranges and lemons. Its absence causes scurvy, a disease which has become very rare now, as most mothers give their children orange juice. The juice of tomatoes or of swede turnips are good substitutes.

Vitamin D is absolutely necessary for the growth of bones and teeth. It is present in the same substances as Vitamin A, more especially in cod-liver oil. This vitamin is formed in the skin under the influence of sunlight, and consequently rickets is a comparatively mild disease in Australia. Vitamin D can now be artificially prepared by the action of ultra-violet rays on a substance which is present in many foods.

Food for Children.

No mother should have any difficulty in giving her children sufficient vitamins if she will take a little pains to give the foods which contain them in good quantity. Children should have milk, butter, eggs, fresh fruit, green vegetables, and wholemeal bread. If they eat ordinary bread they should have bran, bemax, or marmite. If the supply of vitamins A and D are insufficient they should have cod-liver oil. This is important, but it is still more important that expectant mothers should include these foods in their diet for the sake of their babies. They should continue them while suckling for the same reason. After weaning they should continue them for the sake of their own health. While diseases resulting from total absence of vitamins are rare, continued poor health, deficient growth, and a readiness to contract all sorts of infection are a common result of relative deficiency in any one or all of the vitamins. Fresh foods are always better than preserved foods. No woman can keep healthy for long on sugared tea with bread and butter and a bit of meat.

FLOWER GARDENING.

A PLEASANT AND INTERESTING HOBBY.

By H. BURTON-BRADLEY.*

For the making and cultivation of a garden it is necessary to possess certain tools, though others may be added from time to time. First of all, I would suggest a good spade, which requires to be kept bright and sharp—a 12-inch mill saw file is suitable for this purpose. Others necessary include a 6-inch "swan-neck" hoe, an 8-inch Dutch hoe, a 15-inch garden rake, a pair of 9-inch pruning shears, a pick (essential if the ground is hard or stony), and, for handling thorny plants like roses, a pair of garden gloves are desirable, though not absolutely necessary. A 2-gallon watering can and a garden wheelbarrow will be found very handy.

It is advisable to carry out any new work after the autumn rains have fallen, for the ground is then softer to dig and can be put into more workable condition. Preparation at this period leaves ample time for getting the soil in readiness for the winter planting of deciduous plants.

It is generally recognised that deep cultivation is desirable when preparing ground for planting, and I have found double digging quite a success. With this method the spade is used to dig out the first layer of soil, and the hard bottom is then broken up with the pick. On no account should any of the lower soil be brought to the surface.

After this preliminary work it is a good plan to give the land a light dressing with lime, which should be put on in sufficient quantity to whiten the surface, and raked in. The land should be left in this condition for about a month.

Deciduous plants (those that lose their leaves) are best handled in the winter as they then become established before they start to grow. Evergreens are best handled in the early spring.

Roses are without doubt the most popular of all our flowers, being easily grown and hardy. Planted 4 to 6 feet apart and with fair treatment the plants will meet when grown. New roses are very greedy feeders, and it is advisable to put a handful of blood and bone and work it well into the soil in each hole when planting. A good heavy dressing of well-rotted cow manure at any time later does not go amiss.

Before placing the plant in the ground cut off all broken roots cleanly above the break, and cut the head back hard. Plant very firmly in the ground, treading in well when doing so, and water well.

Pruning is best carried out with non-climbing roses in the winter months; climbers are best cut after flowering. The removal of undesirable growths and spindly shoots, which enables the plants to put their energies into the production of flowers, can be carried out at any time.

Carnations are grown from cuttings. New growth 4 to 6 inches is selected, broken off, the few leaves at the base of the stalk removed, and the cutting planted firmly in moist sand, kept damp by occasional waterings. When the cuttings send up

* From a paper read before the December meeting of Moorland Branch of the New South Wales Agricultural Bureau.

their first shoots it is a good plan to draw the centre carefully out of the shoot, as this checks growth and encourages the plant to send out a number of side shoots.

Daffodils are hardy plants and easily grown provided fresh manure is kept away from them. They prefer sandy soil, though any good garden land will grow them.

Dahlias require good soil, plenty of manure and water. A small tuber with one shoot is the simplest way to start a vigorous plant, which should be confined to one stem and tied to a strong stake every foot or so. December is the correct month to plant.

Chrysanthemums may also be planted in December, but good results cannot be obtained without plenty of water. Special treatment is necessary for show purposes, but quite a brilliant display of colour may be obtained by simply allowing the plant to produce all its flowers, and tying up to stakes as required.

The growing of hardy annuals, most of which require to be raised in boxes, and the judicious planting of a few tree ferns and an occasional palm lend a charm to the garden all its own.

Orchard Notes for April.

THE COASTAL DISTRICTS.

In the Orchard Notes for March the attention of citrus growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known in the trade as specking—viz., a rotting of the fruit caused by a mould fungus, and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that specking cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing specking can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy for specking is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury, as the cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and specking follows in due course.

The remedy for specking is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus become toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of specking or injury from fruit flies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For Southern markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to send to the Southern States, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, as from now till the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, in the first place, to retain moisture in the soil, and, in the second, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruit flies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly cleared land time to sweeten before planting.

Farm Notes for April.

FIELD.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April. Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

Potatoes should now be showing good growth and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of "burgundy mixture," a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and where necessary thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—i.e., those which require a fairly long period to develop in, every effort should be made to bring the seedbed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	March, 1931.		April, 1931.		MOONRISE. Mar., 1931.	MOONRISE. April, 1931.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5.48	6.22	6.5	5.47	p.m. 4.2	p.m. 4.51
2	5.48	6.21	6.6	5.46	5.3	5.29
3	5.49	6.19	6.6	5.45	5.47	6.4
4	5.50	6.18	6.7	5.43	6.24	6.40
5	5.51	6.17	6.7	5.42	7.0	7.19
6	5.51	6.16	6.8	5.41	7.35	8.6
7	5.52	6.15	6.8	5.40	8.11	8.58
8	5.53	6.14	6.9	5.39	8.48	9.54
9	5.53	6.13	6.9	5.38	9.29	10.51
10	5.54	6.11	6.10	5.37	10.16	11.48
11	5.54	6.10	6.10	5.36	11.8	...
12	5.55	6.9	6.11	5.35	...	a.m. 12.44
13	5.56	6.8	6.11	5.34	a.m. 12.3	1.41
14	5.56	6.7	6.12	5.33	1.0	2.36
15	5.56	6.6	6.12	5.32	1.54	3.27
16	5.57	6.5	6.13	5.31	2.50	4.14
17	5.57	6.4	6.13	5.30	3.46	5.10
18	5.58	6.3	6.14	5.29	4.40	6.3
19	5.58	6.2	6.14	5.28	5.32	6.59
20	5.59	6.1	6.15	5.27	6.23	7.56
21	5.59	5.59	6.15	5.26	7.15	8.56
22	6.0	5.58	6.16	5.25	8.8	9.55
23	6.0	5.57	6.16	5.24	9.2	10.55
24	6.1	5.56	6.17	5.23	10.3	11.52
25	6.1	5.55	6.17	5.22	11.2	p.m. 12.45
26	6.2	5.54	6.18	5.21	p.m. 12.1	1.33
27	6.2	5.53	6.18	5.21	1.0	2.14
28	6.3	5.52	6.19	5.20	1.58	2.50
29	6.4	5.51	6.19	5.19	2.52	3.23
30	6.4	5.50	6.20	5.18	3.38	3.57
31	6.5	5.49	...	...	4.17	...

Phases of the Moon, Occultations, &c.

4 Mar.	○	Full Moon	8 36 p.m.
11 ,,	☽	Last Quarter	3 15 p.m.
19 ,,	●	New Moon	5 50 p.m.
27 ,,	☾	First Quarter	3 4 p.m.

Perigree, 4th March, at 8.42 p.m.
Apogee, 18th March, at 8.48 a.m.

The Moon will be passing Jupiter on the 27th when at first quarter and both below the western horizon at midnight.

Mercury will rise about an hour before the Sun on the 1st, but with it and invisible on the 15th.

Venus will rise at Warwick at 2.23 a.m. on the 1st, and at 2.41 a.m. on the 15th.

Mars will rise at 4.19 p.m., and set at 2.29 a.m. on the 1st; on the 15th it will rise at 3.41 p.m. and set at 1.33 a.m.

Jupiter will rise at 2.59 p.m. and set at 1.15 a.m. on the 1st; on the 15th it will rise at 1.40 p.m. and set at 12.19 a.m.

Saturn will rise at 2.2 a.m. and set at 3.34 p.m. on the 1st; on the 15th it will rise at 1.10 a.m. and set at 2.44 p.m.

The Southern Cross will be at position IX, 30 degrees east of the south celestial pole, about 8 p.m. on the 1st and about 6 p.m. on the 31st.

3 April	○	Full Moon	6 5 a.m.
10 ,,	☽	Last Quarter	6 15 a.m.
18 ,,	●	New Moon	10 59 a.m.
25 ,,	☾	First Quarter	11 40 p.m.

There will be a total eclipse of the Moon before it reaches the western horizon about 6 a.m. on 3rd April. The first indication of it reaching the shadow of the Earth will be noticeable about 4.23 a.m. For an hour the Moon will be getting deeper and deeper immersed in the shadow of the Earth, and will be totally eclipsed at 5.22. It will continue to be eclipsed for nearly an hour after it has set, at Brisbane, or half-an-hour at Hughenden.

The Moon will occult Sigma Scorpii about midnight on the 6th, and Antares about three hours later. As the time for each occultation depends upon the position of the observer, it will be advisable to be on the look-out perhaps an hour earlier in each case.

An interesting object for observers with telescopes or binoculars will be to look for Saturn in broad daylight on the morning of the 10th. It will be rather more than six degrees (the length of the Southern Cross) to the northward of the Moon when both are approaching the western horizon between 11 and 12 a.m.

Mercury, which was in superior conjunction with the Sun on 15th March, will be in inferior conjunction on 30th April. On the 10th it will be at its greatest elongation, 19 degrees eastward of the Sun, and above the western horizon at that height when the Sun sets.

A partial eclipse of the Sun, confined to the northern hemisphere and of no interest in Australia, will take place on the 18th.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/- including postage.

QUEENSLAND AGRICULTURAL JOURNAL

Vol. XXXV. | 1 APRIL, 1931 | Part 4.

Event and Comment.

The Queensland Dairying Industry.

SPEAKING at the opening of a new butter factory at Chinchilla recently, the Minister for Agriculture and Stock, Mr. Harry F. Walker, who is also a successful dairy farmer, had much of interest to say on the progress generally of the dairying industry in Queensland. In this State particularly, he said, the industry is of the utmost importance in that it is one of the main factors in keeping our trade balance on the right side. Last year Queensland produced 87,000,000 lb. of butter, valued at £6,000,000. That output was 11,000,000 lb. more than the previous best for the State. As a central fact in what may be regarded as an excellent progress report, the year's return was very impressive and indicated what the industry means in our national economy. Of the quantity produced last year, nearly 60,000,000 lb., or 67 per cent., were despatched overseas—a valuable contribution to Queensland's export trade. The Chinchilla district contributed substantially to that record, and the new and larger factory is ample evidence of the progress of dairying on the Northern Downs and its gradual profitable extension westwards. Mr. Walker forecast a great increase in dairying production as more land was made available for closer settlement around Chinchilla and along the Western Line. The improved conditions under which wider areas of Crown land would be opened for settlement, should prove attractive to the younger men of the district, whose experience, energy, and enterprise would thus be retained for the development of rural industries within their home province. In the course of a recent visit to New Zealand he had had many opportunities of observing the conditions of dairying in our neighbouring dominion, and Queensland had little to learn from the progressive farmers there in respect of dairy practice and the quality of the marketable products. One of the main reasons for the success of the industry in this State, averred Mr. Walker, is its widespread co-operative control by the farmers themselves whose heart is in their work, both as cream suppliers and factory directors. Their readiness to adopt every tested modern discovery or development in dairy science and technology

was reflected in the fine quality of their produce—a quality that had not only won high awards in show-room competition, but also on the markets of the Empire. While they continued to produce butter of the highest grade, they should have nothing to fear from foreign competition on the British markets.

Mr. Walker advised the farmers to extend their co-operative movement and also to co-operate with the Department of Agriculture and Stock, particularly in respect of scientific investigation and the practical application of its results in field, dairy, and factory. The departmental herd-testing scheme warranted their whole-hearted support, and the results of its operation were made known regularly in the "Journal" and other publications of his Department which were supplied without cost to the man on the land. The economic possibilities of herd testing and herd culling were shown in some comparative tables of tests carried out by his Department which he had had prepared. Those figures showed that twenty-five good producers, under official tests, yielded 11,943 lb. of butter fat, valued at £875, in 273 days; twenty-five average milkers yielded 6,756 lb., valued at £506, in the same period; and twenty-five poor producers yielded 4,231 lb., valued at £312. Those figures taught their own lesson which every earnest dairy farmer would not fail to assimilate.

A New Dairy Enterprise at Dayboro.

WITHIN three hours' railway run of Brisbane is one of the richest dairying regions of Southern Queensland. Sheltered by the Blackall Range, and watered by the Pine River and its tributaries this district of converted jungle and cleared forest country, carrying the sweetest of pastures, is one of great promise already ripening rapidly into generous fulfilment. As the metropolis grows, Dayboro' must become one of the main sources of supply for the city's breakfast table. Already the daily output of its pastures alone is in great demand, and a central milk distributing depot is ever widening its range of service. The directors of the Dayboro' butter factory, with commendable enterprise, have now added to their plant milk drying machinery capable of converting skimmed milk into powder at the rate of 130 gallons an hour. The resultant product is being placed on the market in 1-lb. cans as "Pine Meadows Skim Milk in Powdered Form." As a new Queensland product, the first of its kind, made under hygienic conditions with modern machinery, right in the centre of rich dairying country, it should receive a welcome from all who believe in encouraging new Queensland industries in a practical way.

Kurrajong—A Useful Shade and Fodder Tree.

KURRAJONG seedlings, in very limited supply, are available for distribution through the Department of Agriculture (in conjunction with the Queensland Forest Service) to farmers and graziers desiring to plant and foster this very useful shade and fodder tree. The Kurrajong (*Sterculia diversifolia*) is familiar to many Queenslanders who appreciate its economic value as well as its usefulness as an ornamental tree and as a shelter for stock on hot summer days. The seedlings may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane. Each request will be dealt with in the order of its receipt, until the small supply at our disposal is exhausted. The distribution will be made in June and July, thus ample time is given to prepare the land for planting in due season.

Grasshopper Control.

GRASSHOPPERS, the familiar yellow-winged variety, are already a cause of considerable anxiety in Northern cane districts, and a timely reminder of practical methods of control has been received from Mr. Edmund Jarvis, of the Meringa Entomological Laboratory, near Cairns. This insect, which is one of the recognised plague locusts, occurs in many other countries. Its last appearance in North Queensland in plague dimensions was in 1912, when a formidable invasion was reported. Control of the small hoppers when about a quarter of an inch in length was obtained at that time by spraying the swarms with soap or kerosene emulsions, or burning them by firing the grass, or with torches made of sacking tied to poles and dipped in some inflammable substance. A simple spray for treating these tiny hoppers may be made by boiling 1½ lb. of hard soap in half a gallon of water, and adding when boiling 2 gallons of kerosene. This is stirred well for about fifteen minutes until it emulsifies and begins to set like a jelly.

When using the spray add six parts of water to one part of the stock emulsion. Apply with a spray pump, using a nozzle throwing a fine spray; or if no pump be available use a watering can fitted with a fine rose. The best time to attack these hoppers is late in the day, when they are least active. Soap emulsion can also be used, made by boiling 1 lb. of "Witch" or other caustic bar soap in about 5 gallons of water.

Treatment for the nymphs or pupal form of this grasshopper when about 1½ inches long before they become winged, and for the adult or winged form, however, is quite different, these later stages of development being generally combated with poison sprays or baits. In cases of very severe outbreaks the nymphs are driven towards trenches about 3 feet deep by 3 feet in width by the aid of canvas screens about 2 feet 6 inches high, the upper 6 inches being formed of American glazed leather to prevent any locusts climbing over. These screens are placed so as to form two sides of a large angular-shaped portion of ground converging towards the trench into which the swarm is to be driven.

A good poison-bait for destroying the winged locusts is made by mixing together the following simple materials:—Sawdust 100 lb., sodium arsenite 1 U.S. quart, salt 5 lb., water 10 U.S. gallons. This should be used to check an advancing swarm by sprinkling fragments about the size of a peanut amongst the herbage, &c., over which the insects will have to pass. When valuable plants are being devoured they should be sprayed with lead arsenate, 2lb. in 50 gallons of water; or with Paris green 1 lb., lime 6 lb., treacle 6 lb., diluted with 160 to 180 gallons of water.

The eggs of this insect are usually deposited in hard ground, such as roadways, open fields, &c., being placed about 1½ inches below ground level, while the top of the egg mass lies half an inch below the soil and is usually covered over with a frothy secretion. When occurring in an eggery in bare or exposed places, as many as 200 separate masses have been found per square foot. An effort should therefore be made to locate the position of these eggeries by watching the winged swarms closely at the time when oviposition is likely to take place. Any patches discovered can be destroyed by harrowing the ground, which will prove most effectual and prevent much future injury.

The object, of course, should be not to stir too deeply, but to scarify and pulverise the soil to a depth of about 2 inches.

Capturing the Common Grasshopper.

VARIOUS well-known appliances have been designed for capturing the young of the common grasshopper (*Locusta danica* Lin.) in the larval and nymphal stages. These appliances consist of shallow pans made of iron or wood, which are drawn either by hand or horse power over fairly level or cultivated land infested with swarms of the tiny or wingless forms of this locust. Perhaps one of the simplest and most effective is the "Robbins Coal Tar Pan," which somewhat resembles a road-scraper. It is made of a stout piece of sheet iron about 6 feet long by 11 inches wide, the front edge of which is turned up about an inch, and the back edge 9 inches. Two other simple pans may be made of ordinary sheet iron 8 feet long, 12 inches wide at the bottom, and turned up a foot high at the back, and an inch at the front. A runner at each end, extending some distance behind, and a cord attached to each front corner, complete the pan, at a cost of about 1s. From 7 to 10 bushels of young locusts may be caught with one such pan in an afternoon. It is pulled easily by two boys, and by running several together in a row, one boy to each outer rope and one to each contiguous pair, the best work is performed with the least labour. Longer pans drawn by horses should be stiffened by transverse partitions, to avoid spilling the liquid, and also with more runners. The bottoms of these pans are coated with coal tar. Lime and kerosene mixed are sometimes used as a substitute. Enough tar is spread over the bottom to cover it well, and when this becomes matted sufficiently with the young locusts as to no longer destroy newcomers, another coat is added, and so on until it becomes necessary to remove the whole mass, when it is shovelled from the pan and burned.

Another simple form of pan, known as the "Price Oil Pan," is made by taking a board from 12 to 15 feet in length as a foundation or bed-piece. Make a tin trough 4 inches deep, 6 inches wide, and as long as required. Divide the trough into partitions by means of strips of tin, so that each partition is a foot long, thus avoiding the spilling of oil. Back of this place a strip of tin 16 inches wide and as long as the trough. The back must be firmly secured by braces running down to the front edge of the board. Underneath place three wooden runners 3 feet long and shod with iron for the trough to ride on. Fill the pan half full of water, and then add a small quantity of kerosene sufficient to cover the water. A horse may be hitched to the machine by fastening a rope to the outside runners.

THE QUEENSLAND SUGAR INDUSTRY.

(Continued from December Issue.)

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

Part XIII.

(c) Mills and Milling Work—continued.

MENTION was made in Part XI. of this history of the names of a number of the earlier sugar-mills, particularly in the Brisbane, Beenleigh, Nerang, Logan, and Albert districts.

In addition to this list it is now proposed to give, as far as possible, the names (and particulars where available) of other mills. Commencing in the South we find there were at least two mills at Marburg. Mr. T. R. Smith, who passed away a few weeks ago, erected a mill at Marburg in 1883, and the first crushing took place in 1884. It was stated that in the same year he added a refinery, and in 1885 a complete electric light system was installed. In 1886 a distillery was erected and steel tramlines were laid throughout the estate to convey cane to the mill. This mill, at the time, must have been a very up-to-date one and was known as Marburg Mill. In giving evidence before the first Federal Royal Commission in 1912, Mr. Smith said his refinery was a small one using animal charcoal. He further said that he had made nothing out of running a sugar-mill. This mill was later taken over by Mr. W. A. Gibson, son of the late William Gibson, of Bingera, but eventually, owing to the day of the small mill being over and the farmers having other crops and not being particularly anxious to grow cane, the Marburg Mill was closed somewhere about the date of the entrance of the Cane Prices legislation.

There was another very small mill at Marburg known as Lark Hill, which also ceased operations a few years ago.

Most of the early mills between Brisbane and Bundaberg have been listed, but at one time there was a very large number of sugar-mills and juice-mills in the Bundaberg district, and in order that the names of these may not be lost, a list of same is furnished:—

LIST OF MILLS CLOSED DOWN IN THE BUNDABERG DISTRICT, AND MANY OF WHOSE ORIGINAL OWNERS LOST THEIR CAPITAL.

Name of Mill.	Owners.
Branyan	C. H. Goodwin.
Kalbar	T. H. May.
Cuba	McDowall Bros.
Sharon	Hy. Palmer and Sons.
Oakwood	Denny and Buchanan.
Millbank	Perry and Co.
Avoca (juice)	John Forest.
Mabbro	F. W. Gladwell.
Waterview	Samuel Johnston.
Albionville	Scott and Walters—later Geo. Noakes.
Kalkie	Olesen and Grotherr.
The Vulcans (juice)	Co-operative Company.
Woodbine (juice)	Buss and Jones.
Duncraggan (juice)	Cran Bros. and Co.
The Grange (juice)	Miss Tanner.
Spring Hill	Noakes Bros.
*Mon Repos	A. P. Barton.

* Mon Repos subsequently became Qunaba Mill.

List of Mills Closed Down in the Bundaberg District, and Many of Whose Original Owners Lost their Capital—*continued.*

Name of Mill.	Owners.
Woodlands (juice)	C. Faulkner.
Summerville	W. Adams.
Windsor	J. Gaylard.
Sherwood	John Lee.
Rubyanna	Sheldon and Kruger.
The Hummock	Farquhar and others.
Sea View	L. Staneig and W. Dart.
Annesley	Co-operative Company.
Glenmorris	Jno. O'Leary.
Hybla	Matthew Walker.
Kepnock	T. Young.
Hopewell	G. Greathead.
Ashgrove	John Clark.
Tegege	R. Jones.
Belle View	M. Wessel.
Yandaran	Fred Poppel.
Windermere	Nott Bros.
Ashfield	C. W. Buss.
Sunnyside	E. Turner and H. Cattermull.
Woondooma	J. Rowe.

These are all the old mills I have been able to discover, but a little later, or perhaps about the same time in some instances, there were the following:—

Name of Mill.	Owners.
Millaquin	Millaquin Sugar Company.
Qunaba	Millaquin Sugar Company.
Fairymead	A. H. and E. Young.
Hermitage	A. H. and E. Young.
Bingera	Gibson and Howes.
Pemberton Grange	Buss and Davidson.
Millbank	Thomas Penny.
Bonna	Bonna Sugar Company.
Poplars	Walker Bros.
Invicta	Buss Bros.
Gin Gin	Co-operative.

To the north of Bundaberg there were also the Miara Mill, owned by A. M. Broom, and Waterloo owned by White Clapperton and Broom.

Between Bundaberg and the Isis there was a mill known as Goodwood, owned by West and Blissett, afterwards purchased by the Fairymead Sugar Company.

Of all these many mills of the 'Eighties and 'Nineties, only the following now operate, viz.:—Millaquin, Qunaba, Bingera, Fairymead, and Gin Gin, but these now turn out much more sugar than was ever manufactured by all the old mills in conjunction.

The following description of Bingera Mill, Bundaberg, was written by Mr. George Stupart, of Maryborough, in 1892:—

"Bingera plantation is about eleven miles from Bundaberg by rail on the Mount Perry line. The factory, which works night and day for about six months, employs nearly 200 white people, including drivers, ploughmen, and others. Out in the fields and handling the cane at the feeders, there are 250 kanakas employed.

"*The Day of the Horse.*

"I saw from 70 to 100 horses at work ploughing, and at other plantation work numerous teams of six horses each drawing twelve wagons or trollies of cane from different parts of the plantation to the factory. Every one busy, everything in order, and everything showing

unmistakable signs of good management and prosperity. This one plantation gives employment and sustains a population, including families, of not less than 600, as it also takes and pays for the whole produce of numerous farms in the vicinity. This year's crushing will be the yield of about 1,000 acres of cane, and the result is expected to reach the splendid total of 3,500 tons of sugar, or as expressed in money, say, £45,000, every penny of which, and in all probability more, will be circulated.

"At night the works and all the out-buildings are lit up with the electric light, so arranged as to avoid shadows so that the workmen are able to work with perfect safety amongst the machinery, all of which is of the highest order.

"Industrious family.

"The Gibson family arrived in the colony in 1864, and settled on the land about the Hemmant, on the Brisbane River. They manfully fought against the extreme difficulties that beset farmers then—more than now. But from the day that they began to make sugar in the primitive fashion of the time they have steadily and surely advanced, exerting a stimulating influence on all around them. In those days all members of the household able to help did so, and manipulated the sugar with such aids as they could find, such as by drying the sugar on cotton sheets and graduating the syrup through banana stalks, &c.

"A fact worthy of note, and of special interest to farmers, is this: That having such an area of land, and such a troop of horses to feed, the Gibsons don't grow maize, or any other horse feed except cane tops, and yet all the horses are corn fed. Most planters do the same thing, so that the more land we get under cane the better chance for those whose farms are distant from water or rail carriage to grow maize."

Turning now to the Isis district (Childers), there were at one time six mills operating. The first of these was at Horton and owned by Mr. Horton. Doolbi Mill (owned by the Cran family) came next, and of this mill the following description has been given by Mr. H. J. Marks, of the Bundaberg Daily News and Mail, in his interesting "History and Incidents of the Burnett":—

"Doolbi and its Mill.

"The Doolbi Mill was situated in a forest pocket near the railway stopping place—there was neither a station nor a platform siding. People arriving there alighted directly on the open line. The mill was opened in December, 1890, when a month's work was undergone. The farmers around who had not sufficient pluck previously to believe in the assurance made then accepted the positive fact, and the result was that, at the end of 1892, Mr. William Cran, the manager for Messrs. R. Cran and Co., had forty-five constituents, and to the north, east, and west the outlook was one succession of bright green waving canefields. Within a radius of 2 miles of the mill the farmers were putting all their scrub land under cane, and the extra area cultivated and ready for crushing for the next season necessitated operations being conducted both day and night at the mill. For the 1892 season Mr. Cran had paid away no less than £11,500 to the farmers (planters they were then called), and consequently a feeling of general security prevailed. Houses, which hitherto were only barely sufficient to hold the family of the farmer, had been added to in good and permanent style. Buggies

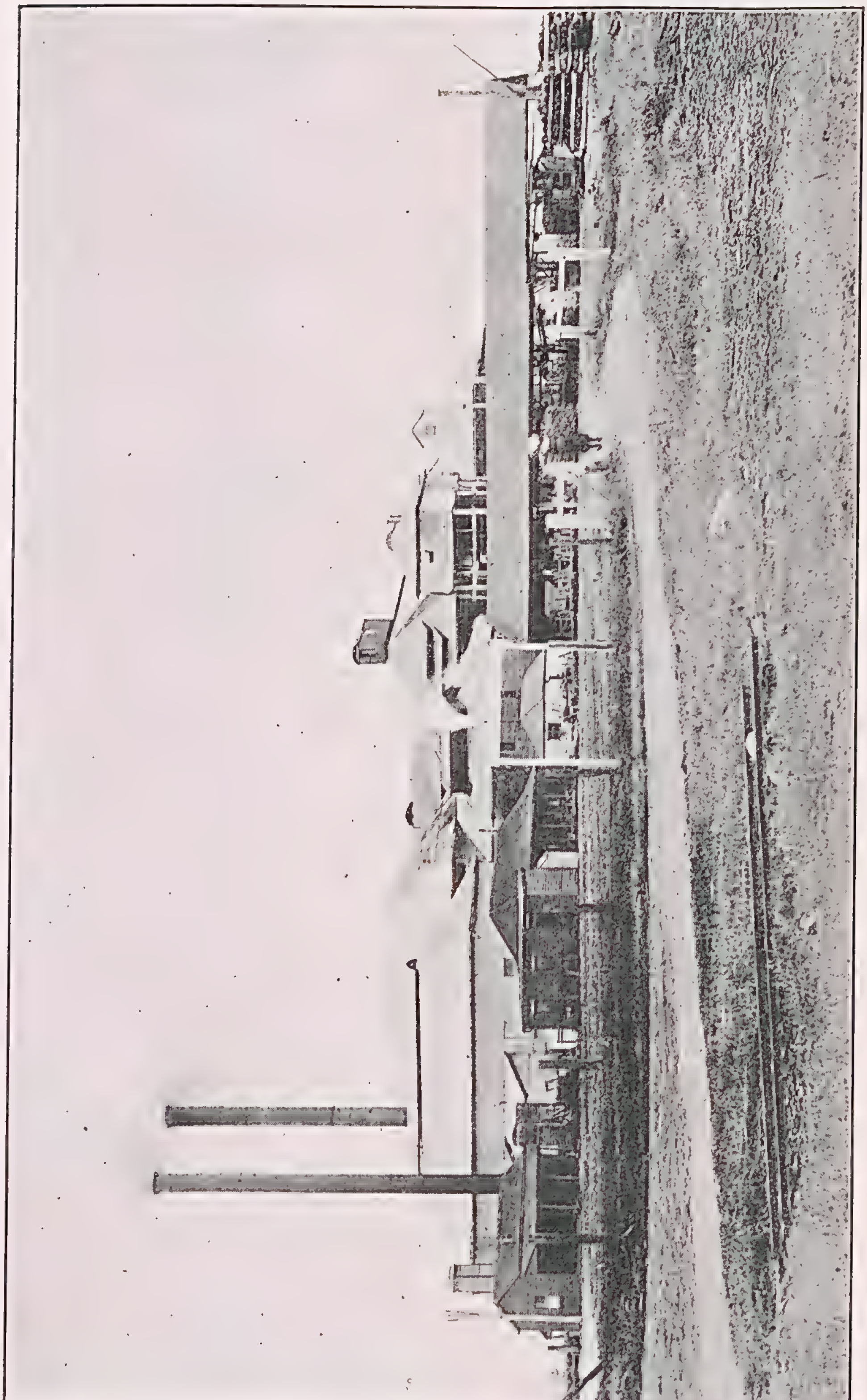


Plate 64.—Bingera Mill in the late 'Nineties.

and pianos and other luxuries had been purchased, and contentment reigned supreme. The word 'mortgage,' too, was becoming obsolete. All these changes, these tokens of prosperity, these evidences of future wealth, were brought about through the erection of the Doolbi Mill.

"A Pioneer Juice Mill.

"The Doolbi Mill was a double crusher, having rollers 60 by 30, and was driven by two engines of 60 horse-power each. The driving wheels were some 25 feet in diameter. There were two carriers, worked automatically, for carrying cane through the rollers, the one being fed on the outside of the mill by kanakas, and the second took the megass through the second set of rollers and thence to the furnaces in which it was used as fuel. The crushing was what was known as the dry process, neither the steam jet nor the hot water spray being applied to the megass before being put through the second mill. This was to save the expense of the extra freight. The juice was pumped into a lime mixer, where a small quantity of lime was added in order to keep the juice in proper condition during its transit by rail to Yengarie, Maryborough. There were two tanks capable of holding 20,000 gallons each, these being supplied with agitators to keep the lime continually at work in the juice. During the 1892 season 24,000 gallons of juice had been produced daily. These juice tanks were placed on the east side of the building, and the railway ran along that side. There were ten tanks for carrying the juice by rail to Yengarie, each holding 2,400 gallons. These were the property of Messrs. Cran Brothers, and cost no less than £105 each. The wheels and bodies of the trucks were provided by the Railway Commissioner.

"These small tanks being drawn alongside, the juice was let out of the receiving tanks into the tanks on the trucks, which were filled in a very small space of time. The emptying of these tanks at the Yengarie refinery was done in the same expeditious manner, for as soon as the train arrived the taps of all the tanks were opened at once and allowed to flow into a huge pipe by funnels, and conveyed thence by gravitation into a storage tank on a lower level.

"At Doolbi, in the 1892 season, 23,000 tons of cane were crushed, the density being between 9 and 9½ degrees Bme. The mill ceased operations from the end of December to beginning of June, when it would start on another seven months' run. Eight white men and three lads had been engaged in the mill, and ninety-one kanakas were employed by the firm. It had been the rule of Messrs. Cran so far to utilise their black labour for the benefit of the planters, large areas of scrub having been felled and burnt off, and the land planted with cane, in an incredibly short space of time. The payment for scrub work was not immediate, but remained to be deducted from the first or subsequent crushings. Not only was the cane planted, but when ready for the knife the Messrs. Cran would cut, cart, and crush it also, if requested so to do."

The next mill was a small one owned by Larsen and Daughter in the South Isis district, of which no particulars are available.

Knockroe Mill was opened about 1893 by Messrs. Buss, Williams, and Penny. The machinery, &c., for this mill was removed from the Bloomfield River, near Cooktown, and the last shipment arrived at Bundaberg per the schooner "Louisa Lamont" on 12th January, 1893. This vessel brought two traction engines, steam plough, and complete

gear, harrows, scarifiers, portable tramway, &c. The removal of the entire plant (800 tons) had required the services of the "Mayflower" 2 voyages, "Fearless" 1, "Lavonia" 1, "Moonta" 1, "Marion" 1, and "Louisa Lamont" 1. The loading and despatching of the plant from Bloomfield River was conducted under the personal supervision of Mr. Penny, of Millbank.

Knockroe Mill was afterwards purchased by Mr. A. C. Walker, of Bingera Cattle Station.

The Colonial Sugar Refining Company next erected a mill at Childers; this commenced crushing in 1895.

The last mill to be erected was the Isis Central Mill, which began operations about 1897.

These last two mills are the only ones left in the Isis district.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

Be Prepared to Combat Grasshoppers.

At the present time grasshoppers are occurring more or less plentifully in the vicinity of cane fields, and during the month of March may cause trouble. In the event of these insects being noticed travelling towards a plantation in army formation (migratory) close to the headland, leaving the ground quite bare behind them, an attempt should be made to arrest their progress by means of arsenical sprays or poison baits. An effective bait can be made up from the following formula:—Sawdust, 100 lb.; sodium arsenite, 1 U.S. quart; salt, 5 lb.; water, 10 U.S. gallons. This must be applied at the rate of 10 lb. to 20 lb. wet bait per acre by sprinkling same in fragments about the size of a small walnut among the advancing locusts. The first appearance of migratory swarms of grasshoppers close to cane areas should be communicated to the Entomologist at Meringa without delay.

Fumigating Grubs of Greyback Cockchafers.

Examine the roots of cane growing on land known to be usually grub-infested, and if finding from six to ten grubs under a single stool fumigate the ground with carbon bisulphide. This must not be applied while the soil is at all wet, but three or four consecutive dry days should be allowed to elapse before treating lighter classes of soils. Two injections of about $\frac{1}{4}$ oz. on each side of a stool of cane and about 3 in. from the stalks should prove effective. Set the injector in manner to deliver the dose just above the level at which the grubs are feeding at the time. Close the holes after withdrawing the spear by pressure with the foot. A drum of bisulphide holds 60 lb., being slightly less than 5 imperial gallons, and equal to 37.60 pints; price, 36s.

Italian canegrowers are asked to apply at Meringa Experiment Station for a leaflet written in their own language describing how to fumigate cane grubs, which has been issued lately by the Assistant Entomologist.

Flowers Which Attract Digger Wasps.

In the "Queensland Agricultural Journal" for January last (vol. xxxv., p. 10), it was pointed out that farmers should do their best to encourage the useful scoliid parasites of our cane grubs to take up their quarters on land adjoining any canefields which are known to be very subject to invasion of this pest. This can only be done by preserving or growing purposely on such areas certain honey-bearing flowers

which are attractive food-plants of these digger wasps. Applications have been received for seeds of favourite wasp-plants, but they are still available for free distribution to any growers who may care to have them.

Weevil Borer Becoming Active.

Watch the growth of your cane on lowlying flats, &c., which is where beetle borers are likely to occur, and if discovering evidence of this cane insect having commenced attack on the basal portion of sticks, communicate at once with the Entomologist at Meringa Experiment Station.

SOME COLEOPTERA OF MINOR IMPORTANCE INJURING SUGAR-CANE IN NORTH QUEENSLAND.

By EDMUND JARVIS, Entomologist, Meringa.

IN the present paper no descriptions are given of the numerous species belonging to various orders of the class Insecta that one usually meets with in canefields, some of which are guilty at times of inflicting insignificant damage to the stem or leaves, &c. Such species form part of what may, I think, be called the insect fauna of cane lands, which naturally embraces a vast assemblage of interesting species, found behind loosened leaf-sheaths, amongst unfolding heart-leaves, or on the roots; many of them, indeed, being more or less beneficial to normal growth of the cane.

The insects described below, however, can certainly claim the title of cane-pest, although their activities happen to be unimportant when compared with the destruction wrought by our greyback cockchafer, locusts, or army worms.

Anomala Australasiae Blkb.

About fourteen species or more of *Anomala* have been recorded from other countries as being more or less destructive to the roots or leaves of such economic plants as vines, cotton, coffee, &c. *Anomala orientalis* Waterh. for example, when introduced into Hawaii from Japan about seventeen years ago, soon turned its attention to sugar-cane, necessitating before long the introduction of one of its natural enemies, a digger-wasp parasite (*Scolia manila Ashm.*) to keep it within bounds.

Fortunately, the activities of *Anomala australasiæ* Blkb. happen to be effectively controlled by those of its various natural enemies; so that although the grubs of this pest occur frequently amongst the roots of cane in Queensland, no decided increase of the beetle has yet been noticed.

Description of the Egg.

The egg and early larval stages of *australasiæ* were worked out by the present writer during 1918-19, the data in connection with same being of scientific interest. A beetle captured 28th November and placed in a breeding cage laid eighteen eggs after an interval of nine days.

These varied slightly in size, so were probably deposited on different days, and hatched on 17th December (nineteen days after capture of the beetle). Other beetles caged on 5th December produced eggs on the 11th, which hatched ten days later.

The egg of this beetle is nearly spherical, smooth, milky-white, and measures about 2.25 mm. longest axis; ten eggs placed in a line with ends touching equalled 22.50 mm.

They are deposited separately in the soil, no cavity being provided to allow for expansion of the chorion.

Description of First Larval Instar.

General colour bluish-grey; head pale fulvous, width of same 2.70 mm.; legs whitish-yellow; arrangement of body hairs very similar to instars 2 and 3; anal path on posterior ventral surface distinct, and defined by short setæ. Length, doubled up position, 9 mm.; length when fully extended, 16 mm.

Description of Second Larval Instar.

Pale bluish-yellow, somewhat shining. Head, legs, and spiracles fulvous; mandibles and labrum castaneous; the former darker towards tips; width of head 4 mm. Peritremes very open, and with exception of first thoracic segment equi-sized. Vestiture reddish-brown, hairs rather long, sparingly distributed on thoracic and first abdominal segments. Posterior area of venter of anal segment with numerous short recurved scattered hairs, and sometimes with little or no indication of an anal path. Length in doubled up position, 15.50 mm.

Note.—When lying on its side in this position the grub assumes a somewhat circular form. Length fully extended 28 mm.; widest transverse measurement, 7.50 mm.

The fully-grown grub (third instar) can be at once distinguished from those of other root-eating scarabæidæ attacking sugar-cane in Queensland by the presence on central portion of venter of anal segment of two longitudinal slightly curved lines of tiny reddish bristles (about nine on each side) surrounded by an irregular patch of longer red hairs. The head, which is yellowish-brown in colour, measures 5 mm. in width.

Description of Pupa.

Colour castaneous to reddish-brown. Pronotum with two distinct tubercules, placed centro-dorsally close to posterior edge. Median groove deeper on meso and metanotum than on anterior portion of pronotum. Dorsal area of seventh to anal segments not raised like the preceding, and ornamented with carinate and more or less longitudinal lines, arranged to form an intricate curved and twisted pattern. Cremaster inconspicuous and without spines. Length about 17 mm., by 9 mm. across first abdominal segment.

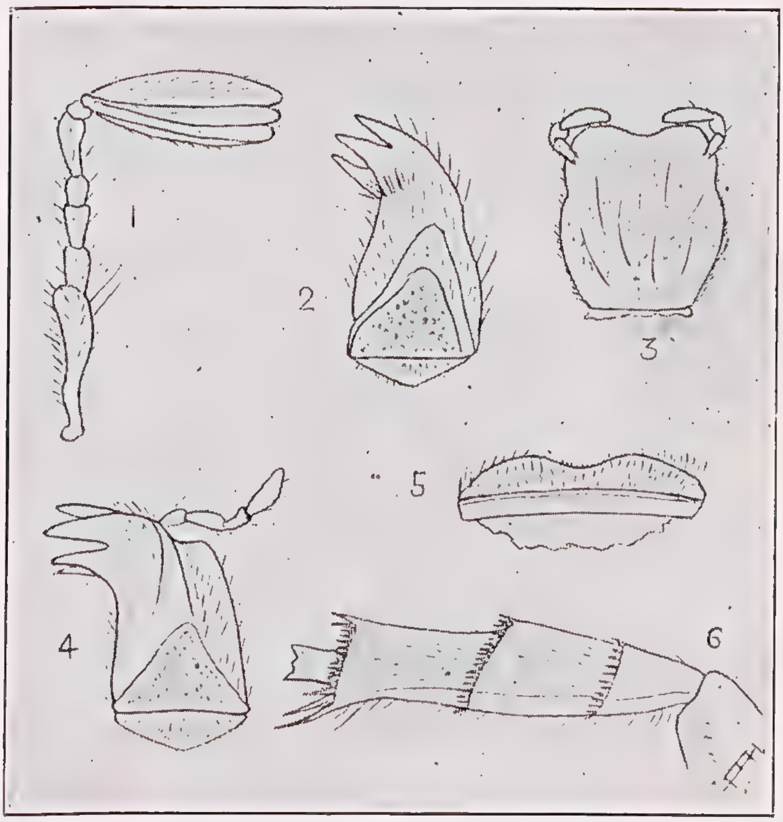


Plate 65.—Details of Parts of Trophi, &c., of *Anomala Australasiae* Blkb.

1. Antenna of female beetle, × 20.
2. Mandible of male of same, × 20.
3. Labium of same, × 20.
4. Maxilla of same, × 20.
5. Labrum of same, × 20.
6. Posterior tibia of female of same, × 12.

Description of Beetle.

Uniform deep blackish-green with changing lustrous lighter tints of pink or bronze. Elytra roughened, finely punctulate, the punctures placed in irregular rows. Scutellum large, equilateral; pronotum smooth, minutely punctate. Head rough, coarsely punctured above, eyes black, large, slightly protuding, and globose, antennal club 3-lamellate in both sexes (Fig. 1). Legs, antennæ, trophi, and venter of abdomen dark-reddish. Coxa of anterior leg cylindrical, as long as femur; tibia with two large teeth and usually indications of a lower third one; tarsus about length of tibia, first joint longer than second and third taken together, last joint (including unguliculi) more than total length of other four. Coxa of posterior leg broader and longer than femur, the outer surface with a few long red hairs and edges turned up forming a slight rim; outer surface of tibia with three transverse rows of short spines and a stout fringe of same on distal end, inner surface flattened, sprinkled with stout red hairs (Fig. 6). Pygidium much the same form in both sexes. Length of body 14 to 16 mm., width about 8 mm.

This beetle has been figured in colour by the writer in the "Queensland Agricultural Journal," vol. xix., p. 336.

Cacachroa decorticata **Macleay.**

During December and January one occasionally notices numbers of this interesting beetle flying erratically on sunny days over grassland, roadways, &c., generally keeping within a few inches of the surface. At such times they can be very easily captured with a butterfly net, and it is possible to soon secure a large number of specimens showing considerable variation in size and colouration.

The grubs of this beetle have been collected from amongst cane roots in sufficient numbers to entitle the species to rank as a minor cane pest, being also

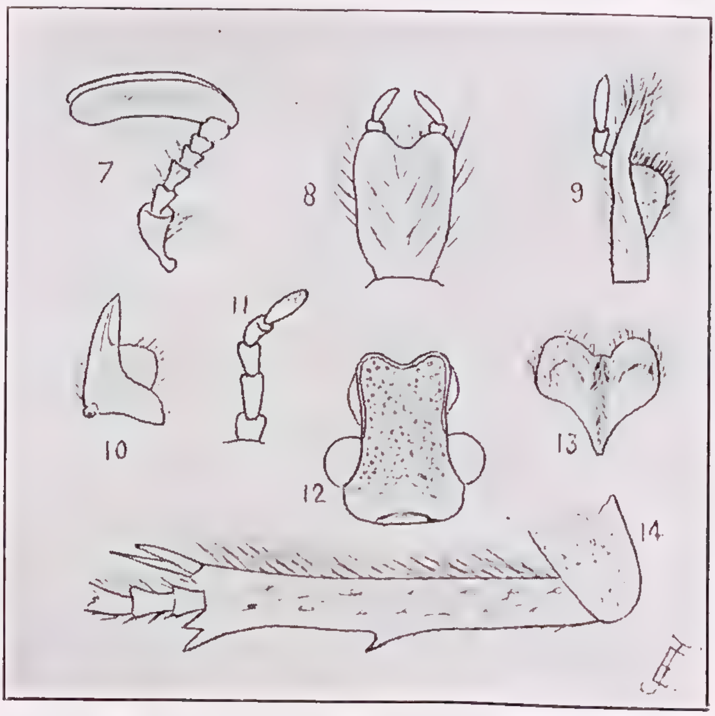


PLATE 66.—TROPHI, &C., OF *Cacachroa decorticata* MACL.

7. Antenna of male beetle, × 12.
8. Labium of same, × 12.
9. Maxilla of same, × 12.
10. Mandible of same, × 12.
11. Antenna of grub of same, × 12.
12. Head of same, × 6.
13. Labrum of same, × 12.
14. Posterior tibia of same, × 6.

common at times under blady grass (*Imperata arundinacea*) both around Gordonvale and farther north. The life-cycle of this insect (from egg to imago condition) is completed in one year, the larva when fully grown tunnelling downwards to a depth of about a foot before constructing a hard oval-shaped cocoon formed of compacted soil in which to transform to the pupal state.

Description of the Grub.

Somewhat onischiform, of swollen appearance from sixth to anal segment, which in the fully-grown larva has a width of about 10 mm., and tapering towards head. When captured the grub doubles up, at such time assuming a nearly circular outline when lying on its side. Head dark reddish-brown, very small, the width in mature larva being about 3.75 mm. Antennæ dark brown, distal ends banded with whitish, terminal joint furnished with about nine sensilia or olfactory organs, appearing as pale yellow spots of circular or oval outline placed mostly near the tip (Fig. 11). Legs very short, spine at end of tarsus arising from a thickened base and surrounded by long hairs. The short reddish spine-like hairs on venter of anal segment form a patch on its posterior portion, those at the centre being closer together, surrounding and pointing towards a bare oval central area. Body length when extended about 25 mm., when incurved about 19 mm.

Description of Beetle.

Uniform shining black, elytra and pronotum very coarsely punctulate or irregularly pitted, the punctures on central area of alytra being sometimes confluent, with raised centres and roughly arranged in lines; sides of elytra covered with numerous transverse strongly marked carinations or wrinkles. A large creamy or straw-yellow irregular blotch occurs on central area of each eytron, while others of similar colour and very variable size are arranged as follows, viz.:—One or two on each outer edge of pronotum, two on pygidium, from two to four on the sides of abdominal segments against edges of elytra, and one or two on each side of metathorax. These blotches have a smooth felted appearance, and in some specimens are entirely absent. Vertex of head extended anteriorly, with dorsal edges carinate (Fig. 12); club of antenna large, 3-lamellate, a portion of the outer surface of inner plate hirsute (Fig. 7); trophi as shown in sketch. Anterior tibæ with three teeth; posterior tibia with one central tooth, and distal edge provided with three teeth and two long spurs. Length of beetle about 14 mm., width 7 mm.

Description of Pupa.

Colour yellowish-brown, wings reaching to posterior edge of second abdominal segment, hind tarsi reaching to anal segment. Spiracles obtuse ovate, inconspicuous, edge of stigma exserted. A decided hump of circular convexity occurring close to each outer posterior angle of the pronotum; hind margin of cremaster strongly carinate dorsally. Scutellum large sub-acute, with tip slightly cleft. Length of pupa 16 to 18 mm.

The eggs of this beetle, which are said to hatch about a fortnight after oviposition, can be found in the soil from December to January.

***Dasygnathus Australis-Dejeani* Macl.**

This dynastid beetle is one of the first to appear on the wing in canefields during October and November. Its presence in firm soil is usually betrayed by a small round hole, against which one often sees a small pile of loose earth—which forms the entrance to a short subterranean tunnel, a beetle being generally found at the bottom. Data obtained by the present writer when breeding this species in 1918 from eggs laid by a specimen captured in October, has shown it to have a life-cycle of only one year. This beetle flies readily to artificial lights, often coming into houses, attracted by lamplight, &c.

Its range of flight is also very extensive, embracing the sugar districts of New South Wales to Mossman.

The Egg Stage.

The eggs are deposited each one in a cavity by itself, which is made large enough to allow room for the egg to expand during development. It was noticed at the time (1918) that in each case these cavities were made in small nodules of compact earth. This stage of its metamorphosis occupies a period of about nineteen days.

The ovum, which measures 2.70 by 2.90 mm., is white, elongate-ovate, with ends less obtuse than those in the egg of *Lepidiota frenchi* Blkb.

Habits of Grub.

Larvæ of this insect are known to attack growing cane setts, eating into them and also devouring or tunnelling the basal portion of cane shoots below ground.

A collection of these grubs from plough furrows made around Gordonvale about twenty years ago yielded a bigger percentage from canefields than from under forest grasses.

They are found more commonly in clay loam lands than in the lighter redsoils.

Description of the Grub (Third Instar).

Colour yellowish-grey. Head castaneous, punctulate, mandibles roughened, black, a deep channel on outer frontal surface extending from base of antenna to end of labrum; basal joint of antenna somewhat globose, second and fourth joints about equal length, third joint longest, distal ends of second and fourth whitish, sensilia on terminal joint conspicuous. Legs rather short, thin, light yellow, with numerous brown hairs. End of venter of anal segment fringed with rather long golden-brown hairs, and with a patch of short spine-like dark hairs on the posterior half. Sub-dorsal cervical shield shining brownish-yellow, concave, mostly with one seta, its lower edge about opposite thoracic spiracle. Peritremes of abdominal spiracles brownish-yellow, bulla convex. Dorsal surface of abdominal segments 1 to 7, with numerous short dark, spine-like hairs; sides of body below spiracles furnished with many rather long light-yellow hairs. Length of grub when doubled up 28 mm., when fully extended 44 mm.; width of head 6.25 mm.

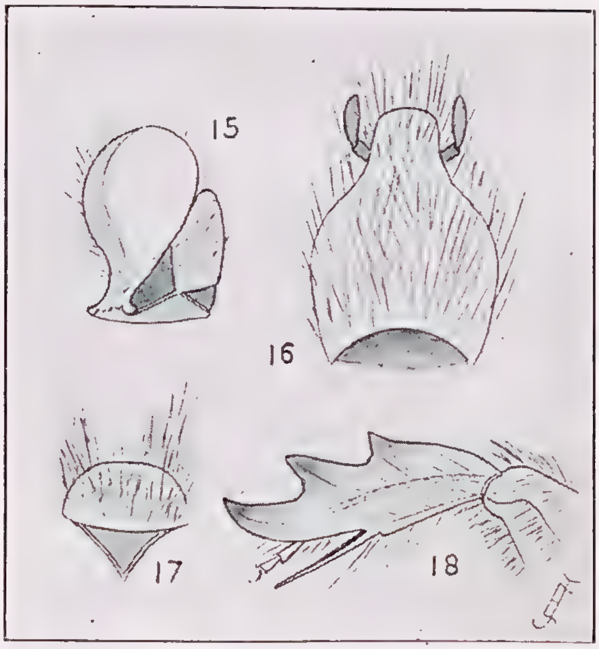


PLATE 67.—DETAILS OF PARTS OF TROPHI, &c., OF *Dasygnathus Australis-Dejeani*, MACL.

15. Mandible of male beetle, × 20.
16. Labium of same, × 20.
17. Labrum of same, × 20.
18. Anterior tibia of same, × 8.

Description of the Beetle.

Dark reddish to nearly black. About seven irregular lines of punctures on each elytron, which are less conspicuous towards ends of elytra, and strongly marked on basa portion of same. Pronotum smooth, punctures very small, anterior and lateral edges slightly turned up; dorsal surface in female without concavities, but in male with frontal portion concave, the upper edge of concavity being produced cephalad centro-dorsally into two very short obtusely pointed horns. Vertex of head punctuate,

supporting in male a rather long bluntly pointed horn, curved slightly towards thorax, and being absent in the female beetle; edge of vertex sharply ridged. Labrum, labium, mandibles, maxillæ, and first antennal joint armed with many stiff reddish hairs; club of antenna short, 3-lamellate in both sexes. Legs spined and very hairy; anterior tibiæ flattened for digging, outer edge provided with three large teeth (Fig. 18). Length of beetle 20 mm. by 11 mm.

Description of the Pupa.

Dark reddish-yellow. Sutures on centro-dorsal portion of abdominal segments 1 to 6 sulcate, enclosing dark red slightly curved carinæ of horny consistency. Spiracles of abdominal segments 1 to 3 open, circular, with edge exserted. End of cremaster bifid, rather densely clothed with short whitish hairs. Intermediate tarsi not reaching end of elytra; anterior tarsi reaching to sixth abdominal segment. Tips of palpi and antennæ dark red. Length of pupa 22 to 24 mm., width 10 mm.

THE CANE GRUB SITUATION FOR 1931.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report (27*th February*, 1931), *covering the period January to February*, 1931, *from the Entomologist at Meringa, Mr. E. Jarvis:—*

Some anxiety was experienced this season in certain localities near Cairns and Gordonvale during October to December last, at the time when cane beetles made their first appearance after falls of 3 in. or 4 in. of rain. The Cairns district as a whole registered 8.59 in. for December, which happened to be four points in excess of our average rainfall for that month, so that conditions looked propitious here for development of the egg and early larval stages of our greyback cane beetle.

At Greenhills an unusually early emergence of these cockchafers took place in October, followed by additional flights in November and December. Beetles were observed on the wing at South Johnstone throughout the mill area about the middle of November, and since then a further fall of about 8 in. of rain was probably followed by another emergence of these cockchafers.

We may always expect more trouble than usual from this pest during seasons in which the first spring rain occurs, at a time when a large proportion of the beetles are not sufficiently matured to leave their pupal cells. Such condition may result either from belated pupation of these grubs owing to the occurrence of unfavourable climatic factors during their second and third larval instars, or from rainfalls in October or the beginning of November.

Ideal seasons, on the other hand, are those in which the first few inches of rain chance to fall at a time when practically the entire body of greybacks are not only fully matured, but desirous of seizing the first opportunity to escape from the subterranean confinement of their pupal cells. During such seasons these beetles generally emerge en masse, and, as no secondary flights are likely to follow, the grower is able, when commencing fumigation work, to destroy all the grubs present without needing to worry about any possible reinvasion of his cane land by grubs arising from later broods of beetles.

On some farms, where fumigation is now in progress (13th February), grubs of the first, second, and third instars of growth may be seen all feeding together, many of those in the third or final stage being nearly ready to pupate. In order to meet this sort of infestation it becomes necessary to defer control work until all first-stage grubs arising from later emergences have appeared in the block to be fumigated. Although such delay may not always be possible, it often happens that a week or two chances to occur in February when the ground is sufficiently open for treatment with fumigants.

How to Control Cane Grubs.

The success obtained during the last two or three years with carbon bisulphide, paradichlororobenzene, and other liquid insecticides has apparently induced additional growers to attempt to combat the ravages of this cane beetle. In some quarters a decided reaction has set in in favour of using carbon bisulphide, such feeling being due to successes resulting from its use last season, secured by certain farmers, who, having tried this fumigant both mixed with paradichlor and used alone,

obtained a cane grub mortality of 100 per cent. simply by using the carbon bisulphide only. The merits of this well-known grub destroyer have been repeatedly advocated in reports and bulletins issued from time to time at Meringa Experiment Station, the points emphasised again and again if wishing to secure success with this fumigant being—

(1) Certainty as to the soil to be treated being properly open or aerated;

(2) See that injections be placed just above the level at which the grubs are feeding;

(3) Do not fumigate when the surface soil is loose and dry;

(4) Avoid working the soil for about a fortnight both before and after treatment;

(5) Commence fumigation if possible at a time when the ground is moist but permeable to the toxic fumes, and the surface even and slightly compacted owing to recent rains.

VISITS TO OTHER SUGAR-GROWING DISTRICTS.

The following brief account of some of the work being carried out in various sugar centres has been handed to Mr. Jarvis for inclusion in his report by Mr. J. H. Buzacott, Assistant Entomologist:—

Mossman.

A trip was made to Mossman between 7th and 9th January in order to assist farmers who are commencing fumigation there. This work is proceeding on two farms in the district, and the grub infestation in both places was very heavy, the cane on one of the farms showing yellow patches even at that early date. Good results are anticipated from the work if instructions are faithfully adhered to.

Tachinid Flies.

On 23rd January a consignment of fifty Tachinid flies was taken to South Johnstone and liberated in two different parts of the district. Owing to the large amount of standover cane there the borer will probably be somewhat worse than last season.

A consignment of sixty flies was taken to Tully on the 13th February and liberated in a block of standover at Djarawong, where the borer infestation was fairly heavy. Parts of the Tully district are suffering from a plague of grasshoppers (*Locusta danica* Linn.), which have not yet attacked the cane, but are stripping the roadside of grass. Should a further generation of these grasshoppers materialise, considerable damage to crops is likely to result.

CANE PRICES BOARDS.

His Excellency the Governor, with the advice of the Executive Council, and in pursuance of the provisions of "*The Regulation of Sugar Cane Prices Acts*, 1915 *to* 1922," has appointed the following persons as representatives of the owner or owners of the mill, and as representatives of the canegrowers, to be members of the respective Local Boards hereinafter specified, and has been pleased to appoint the persons so designated as chairman thereof, respectively:—

Babinda Local Board—

Millowners' Representatives—F. A. Lamont and W. J. Ryan.
Canegrowers' Representatives—D. O. James and S. H. Warner.
Chairman—A. H. O'Kelly.

Bingera Local Board—

Millowners' Representatives—A. J. Gibson and B. A. Bourke.
Canegrowers' Representatives—L. G. Scotney and C. W. Thiele.
Chairman—C. D. O'Brien.

Cattle Creek Local Board—

Millowners' Representatives—P. H. McLean and C. Simonsen.
Canegrowers' Representatives—E. McIntyre and F. W. Valentine.
Chairman—T. E. Dwyer.

Childers Local Board—

Millowners' Representatives—J. H. D. Goldie and M. B. Heath.
Canegrowers' Representatives—J. Broadhurst and J. W. Clayton.
Chairman—H. B. Carney.

Fairymead Local Board—

Millowners' Representatives—E. S. Young and C. G. Wauchope.
Canegrowers' Representatives—F. J. Wheeler and P. E. Scotney.
Chairman—C. D. O'Brien.

Farleigh Local Board—

Millowners' Representatives—T. G. Mulherin and J. Smith.
Canegrowers' Representatives—P. Kirwan and M. Shannon.
Chairman—M. Gallagher.

Gin Gin Local Board—

Millowners' Representatives—G. Stevenson and H. G. Mittelheuser.
Canegrowers' Representatives—J. Laurison and G. Powell.
Chairman—C. D. O'Brien.

Goondi Local Board—

Millowners' Representatives—E. Irving and R. T. Challinor.
Canegrowers' Representatives—W. D. Davies and W. J. Burke.
Chairman—A. E. Aitken.

Hambledon Local Board—

Millowners' Representatives—J. G. L. Gillett and L. M. Smith.
Canegrowers' Representatives—W. Browne and W. W. Chapman.
Chairman—A. H. O'Kelly.

Inkerman Local Board—

Millowners' Representatives—W. Gibson and H. G. Bell.
Canegrowers' Representatives—E. E. Turnbull and F. J. Woods.
Chairman—T. R. Kennedy.

Invicta Local Board—

Millowners' Representatives—H. B. Burstall and J. L. Mullins.
Canegrowers' Representatives—P. Hayes and H. F. Hecht.
Chairman—T. R. Kennedy.

Isis Local Board—

Millowners' Representatives—A. Adie and J. Alison.
Canegrowers' Representatives—W. M. Duncan and A. W. Macpherson.
Chairman—H. B. Carney.

Kalamia Local Board—

Millowners' Representatives—R. H. Farrar and R. K. Calcutt.
Canegrowers' Representatives—W. H. Ferguson and H. A. Wellington.
Chairman—T. R. Kennedy.

Macknade Local Board—

Millowners' Representatives—A. J. West and H. Freeman.
Canegrowers' Representatives—G. Cantamessa and T. J. McMillan.
Chairman—J. A. Murray.

Maryborough Local Board—

Millowners' Representatives—T. E. Braddock and O. C. Kinne.
Canegrowers' Representatives—F. F. Bertram and H. Doss.
Chairman—J. M. Bracewell.

Millaquin Local Board—

Millowners' Representatives—G. S. Moore and E. P. Wyllie.
Canegrowers' Representatives—F. Courtice and T. Scotney.
Chairman—C. D. O'Brien.

Moreton Local Board—

Millowners' Representatives—W. McD. Whalley and G. Greathead.
Canegrowers' Representatives—W. Kittle and A. E. Williams.
Chairman—S. L. Stormonth.

Mossman Local Board—

Millowners' Representatives—C. J. Crees and E. J. O'Brien.
Canegrowers' Representatives—R. D. Rex and H. B. Schnitzerling.
Chairman—F. W. Schafer.

Mount Bauple Local Board—

Millowners' Representatives—T. Beattie and W. C. Cunningham.
Canegrowers' Representatives—W. J. Douglas and H. Jeppesen.
Chairman—J. M. Bracewell.

North Eton Local Board—

Millowners' Representatives—G. Johnson and S. H. Scougall.
Canegrowers' Representatives—W. H. Keen and G. N. Laws.
Chairman—T. E. Dwyer.

Pioneer Local Board—

Millowners' Representatives—C. S. Wynter and B. C. J. Martin.
Canegrowers' Representatives—B. S. Donovan and L. W. J. Hoey.
Chairman—T. R. Kennedy.

Proserpine Local Board—

Millowners' Representatives—M. R. Gibson and C. C. Dodd.
Canegrowers' Representatives—H. L. Hall and T. G. Mann.
Chairman—C. A. K. Morrison.

Qunaba Local Board—

Millowners' Representatives—G. S. Moore and W. A. Shield.
Canegrowers' Representatives—A. J. Christensen and C. F. Mittelheuser.
Chairman—C. D. O'Brien.

South Johnstone Local Board—

Millowners' Representatives—J. T. McNamee and F. Gillan.
Canegrowers' Representatives—F. Darveniza and S. Gullotta.
Chairman—A. E. Aitken.

Tully Local Board—

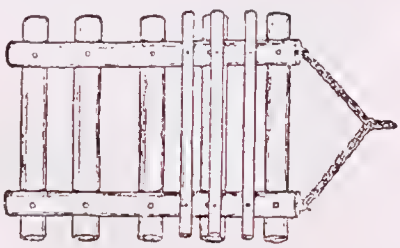
Millowners' Representatives—J. J. Cran and G. R. Blair.
Canegrowers' Representatives—H. N. Lund and J. A. Winter.
Chairman—A. E. Aitken.

Victoria Local Board—

Millowners' Representatives—E. F. Hayley and J. R. Kerr.
Canegrowers' Representatives—H. E. Hollins and G. G. Venables.
Chairman—J. A. Murray.

A CLOD CRUSHER.

A simple clod crusher can be constructed on any farm, and the cost is practically nothing. In use, it will be found as effective as a Cambridge roller, and on some soils it will leave a better seed bed.



The sketch describes it. Poles used are of not less than 5 inches diameter. The two cross poles 5 feet long, and the two lengthways one about 8 feet. Distance between cross poles about 18 inches. Bolts should be as stout as possible.

Above the long poles may be bolted lighter ones to carry rocks, which act as ballast. Rocks are added or removed according to the nature of the soil.

THE BACON FLY OR HAM SKIPPER.

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

DURING the earlier part of 1930 it was reported to this Department that severe losses were being brought about in several of the bacon factories in this State through the depredations of the bacon fly or ham skipper.

Correspondence with the several factories situated in Queensland indicated that this insect was known at each and every factory, and that unless certain control measures were rigorously and continuously maintained severe losses were experienced.

Plate 68.—The Bacon Fly or Ham Skipper (*Piophila casei* Linn).
Fig. 1. Adult, × 9. Fig. 2. Larva, × 9.

The Adult.

The adult (Plate 68, fig. 1) is known scientifically as *Piophila casei* Linn., and is a dark bronze fly measuring about $\frac{1}{6}$ inch in length—i.e., about one-third the size of the common house fly. It is world-wide in distribution and frequents storage and curing rooms and other situations where suitable breeding places may be found. Besides bacon it may attack and be reared from cheese, dried fish and flesh, and carrion.

The Egg.

The egg is a tiny, white, slightly curved, narrow body, somewhat tapering at each end and measuring about 1/30 inch in length. The eggs are usually deposited singly over the surface of the bacon, particularly in cracks or broken surfaces. Hatching at 65 deg. Fahr. occurs in thirty to forty-eight hours.

The Larva.

The newly hatched maggot is transparent and so small as to be hardly visible. At temperatures of 65 to 95 deg. Fahr. full growth is reached in eight to fifteen days, and at this stage the larva is yellowish-white, tapering towards the head and about $\frac{5}{8}$ inch in length (Plate 68, fig. 2). The peculiar habit of the larva in curving both ends together and then suddenly springing to a distance of three to six inches has given it the name of "skipper."

The Pupa.

When mature the larva comes to the surface, seeks a secluded place, and changes into the pupa enclosed in a hard-shelled, brown case about $\frac{1}{5}$ inch long. Pupæ may be found under the bacon cloth or in dark places in the storerooms. At 65 to 95 deg. Fahr. the adult fly may emerge from the pupa in seven to twelve days. Thus the entire life cycle may be passed in about seventeen to twenty-nine days.

The Losses Caused by the Bacon Fly.

The maggots are confined to the fatty tissues of the cured product in which they burrow and feed. The actual damage caused by their presence, unless they occur in large numbers, is not very extensive, the losses being chiefly due to the unwholesome appearance of the infested bacon, the annoyance to manufacturers and dealers, the expenses connected with control treatment, and a lessened consumption by the individual who is naturally disgusted by the presence of the maggots.

Control Measures.

(1) Strict cleanliness in all parts of the factory and its surroundings is essential. The fly is capable of breeding in the smallest accumulation of grease, and has been known to breed successfully in the small amount of grease that accumulates on cutting up and packing benches. Scrap-meat, trimmings, &c., should be disposed of as soon as possible. Regular limewashing of all floors and walls of storage rooms is recommended, as this measure aids in maintaining hygienic conditions.

(2) All bacon returned from retail shops as maggoty should be at once destroyed without opening. It is well known that in Brisbane, at least, fair numbers of this small fly frequent retail shops, and the bacon blown by these flies is returned to the factories. Opening such returned bacon entails grave risks of introducing further numbers of the fly.

(3) Bacon should be clothed as soon as possible after curing and the cloth kept firm and smooth.

(4) The bacon should not be stored for any length of time except in cold storage. Temperatures of 30 to 36 deg. Fahr. are sufficiently low to kill all stages of the fly except perhaps the egg.

(5) Screening with 24 to 30 mesh gauze is decidedly useful in keeping out the flies attracted from elsewhere. The species is exceedingly common during the warmer months, and as it may successfully breed in carrion the need for screening is stressed.

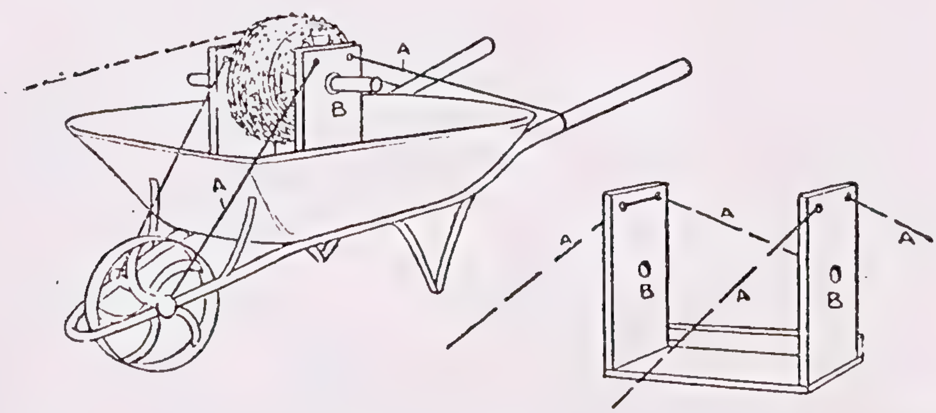
(6) Frequent spraying with insecticides may give results, but the operation is tedious. Fumigation would, of course, be most likely to give the best results, but, unfortunately, the data concerning its use is too meagre to warrant its recommendation.

It is only by the repeated application of the above measures and the observance of strict cleanliness that the pests can be controlled. It should be remembered that these control measures should be enforced and maintained so long as flies can be seen, and the practices of spraying, &c., only when the flies are bad are likely to give but temporary respite.

A ONE-MAN FENCING ARRANGEMENT.

The illustration is of assistance to fencing when only one man is available.

Trying to pay out barbed wire when alone usually ends in twisting it round your neck or tramping backward and forward over the same ground because the wire has stuck on the roll.



I always take my tools in the wheelbarrow when going to do a job, and by fastening the wooden frame, as illustrated, in the wheelbarrow by the wires, or riems (A), passing a crowbar or stick through the roll and two holes (BB) and fastening the loose end of the wire to the straining pole and pulling the barrow (wheel behind), the wire pays out.—"Farmers' Weekly" (South Africa).

10,000 YEARS IN A SILO.

Grains of barley believed to be 7,000 to 10,000 years old, which were discovered in Egypt some years ago, were exhibited by Dr. E. S. Beaven in England recently. The barley was found in a pit lined with woven straw, and is in a remarkably good state of preservation. Dr. Beaven was presented with the Horace Brown medal for "eminent services on the scientific or technical side of the fermentation industries." In his lecture on "The Culture of Barley for Brewing," Dr. Beaven said that the origin of all the present races of cultivated barley was the wild forms of Hordeum, still to be found growing in Palestine, Syria, Persia, and further east. Evidence went to show that barley was the first plant cultivated by man, and the rise of civilisation could be dated from the time when it was first deliberately sown for food.

THE VALUE OF POSTMORTEM EXAMINATION IN DETECTING DISEASES AND DISORDERS IN POULTRY.

By P. RUMBALL, Instructor in Poultry Raising.

IT is well at the outset to point out that the writer does not recommend as a general practice the treatment of poultry for sickness. At the same time, it is of considerable advantage to the general breeder to have a working knowledge of diseases to enable him to prevent or combat the outbreaks.

There are many diseases which cannot with any degree of certainty be correctly diagnosed while the bird is still alive. By most breeders dead birds are either burnt or buried immediately they are found, and the early evidence of possibly a serious outbreak of troubles is lost.

The practice of burning or burying dead bodies is not discounted by the above remarks, but all diseases of a bacterial or highly contagious nature have a small beginning, many spreading per medium of the droppings, and the fact of having burnt or buried a diseased bird has not eliminated the possibility of further losses, but it has withheld information which if it had been available may have been responsible for earlier measures being taken for the prevention of further trouble.

Apart from actual diseased conditions being disclosed, there is the more or less physical aspect to be considered, such as the general conditions of the internal organs due to feeding, and also as a means of definitely determining to what extent internal parasites are present.

There are many methods of making a postmortem examination, but the system outlined in this article is both simple and effective. Even by examination it will be somewhat difficult to make a definite pronouncement as to the cause of death, but all poultry keepers should have by actual experience in dressing healthy stock a fair knowledge of what healthy organs are like, and by the constant examination of birds that die on their farms become more efficient.

The lines suggested to open a bird are—first with a sharp knife slit the skin between the legs and abdominal walls; this allows the hip joint to be easily dislocated, the legs bent at right angles causing the bird to lay fairly firmly upon its back as shown in Fig. 1. Then with a pair of scissors cut the skin from leg to leg, bearing around in a circular fashion, getting as close to the vent as possible. Next tear the skin off right up to the head as in Fig. 2. This removes all the feathers, and in opening abdomen particles of feathers are not obstructing examination.

Fig. 3 shows the bird with the breastbone completely removed, exposing the internal organs in their natural position. This is done by cutting around the abdominal wall as close to the back as possible and right through the bones. To do this work a good pair of curved scissors having a ball point are an advantage, but failing these the work can be performed with ordinary scissors or a pair of tin snips such as most poultry breeders possess.

EXPLANATION OF FIG. 4.

1. Œsophagus; 2, crop; 3, proventriculus or stomach; 4, gizzard; 5, duodenum; 6, intestines; 7, cæca; 8, cloaca; 9, vent; 10, egg in oviduct; 11, oviduct; 12, kidney; 13, ovary; 14, lung; 15, heart; 16, trachea; 17, liver; 18, spleen; 19, gall; 20, developed egg yolk.

Having the internal organs exposed, the next stage is to commence on their examination. In their present position the liver is the most prominent organ, and an organ of considerable importance. It is this organ which prepares the bile, one of the principal digestive juices, and it also assists in some of the necessary chemical changes of the blood. It contains many blood vessels, and is particularly subject to the attacks of parasites, which are carried there per medium of the blood stream.

Among the principal abnormalities found in this organ is its enlargement. This enlargement may be due to many infectious diseases, such as tuberculosis, fowl cholera, hepatitis, &c., and in these cases the liver is generally of a spotted appearance, due to dead tissue; but possibly the greatest cause of liver enlargement is due to the lack of exercise combined with improper feeding, or from the feeding of mouldy or putrifying foods. The excessive feeding of protein foods is merely indicated by a bluish grey streakiness; while yellow streakiness is generally an indication of a fatty condition which frequently results in internal hemorrhage. The latter trouble is frequently met with in heavy breed varieties of poultry which are confined and fed on stimulating foods. They are by nature lazy or inactive, thereby laying on surplus condition.

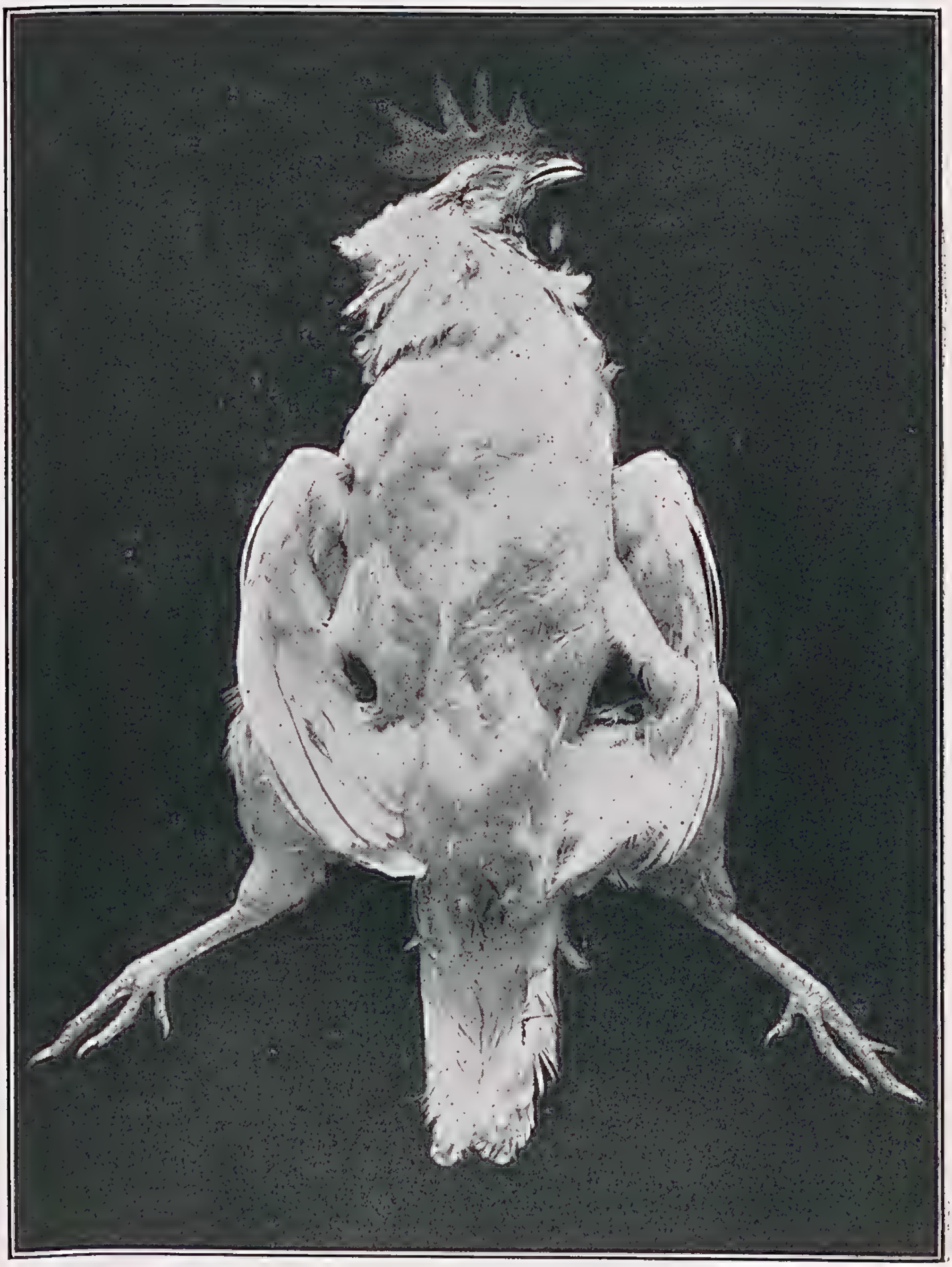


Plate 69 (Fig. 1).—First Stage of Postmortem.

PLATE 70 (Fig. 2).—SECOND STAGE IN MAKING POSTMORTEM.

To proceed with the examination sever the gizzard from the proventriculus. The gizzard and intestines are then easily separated from their attachment and readily drawn out for examination. The chief thing to look for in the intestines is inflammation. This inflammation may be due to worms of all descriptions, the feeding of mouldy or putrifying foods, foods containing excessive quantities of fibrous matter (especially when fed to young chickens), poisons and infectious bacterial diseases. However, in Queensland, most losses by diseases of a bacterial nature occur among young chickens. This is undoubtedly due to the confined conditions under which they are reared. The cæca when distended and filled with pus and particles of blood indicate bacterial trouble, while if trouble is caused through feeding fibrous or poisonous foods blood only is generally present. Worms of various species will be found in the cæca, intestines, gizzard, proventriculus, and crop, causing inflammation of the various parts if infestation is severe, consequently heavy losses.

The gizzard acting as a grinding organ breaks down grain and hard foods, preparing them for the digestive juices. If grit is not supplied to assist in the grinding process indigestion is likely to occur. This organ is subject to attacks of a special class of worm, the presence of which is only known by postmortem. Following up the digestive track the proventriculus or glandular stomach is met. The walls of the organ are of considerable thickness and its capacity slight, being fed gradually by the crop. In the walls of this organ are glands which secrete juices for the digestion of the albumenoids. This organ is subject to inflammation, due to improper digestion of food. If the gizzard is not functioning as rapidly as it should, due to the lack of grit or presence of worms, the stomach becomes unduly distended, and the contents being retained too long cause an irritation. Impure drinking water, ingestion of too large a quantity of food, inferior and improper foods, and similar substance would also be responsible for trouble. The crop, acting as a reservoir, as it were, for foods, is subject to the irritating effect of incorrect feeding, which causes a catarrhal condition or inflammation. The withholding of water, food, or grit for some considerable time induces a bird to gorge, with the consequence of the crop becoming distended, and the muscular coat partially paralysed. The crop is also subject to impaction, due to the bird swallowing long grass, feathers, &c., but postmortem is not essential to diagnose this trouble.

The spleen lies to the right of the proventriculus and gizzard. Its colour is reddish brown, and in form is generally rounded. This organ in common with the liver is liable to infection with tuberculosis.

The reproductive organs of the hen consist of an ovary where the ovums or egg yolks are formed, and the oviduct where the yolk is encased in the various layers of albumen, and finally the shell. They are both very vascular organs and subject to congestion due to errors in feeding, as well as to many disorders which may be classed as physical disorders. Physical or structural disorders are of interest only, and are in no way of an epizootic nature. Inflammation of the oviduct and ovary, due to the prolonged feeding of food of a highly nitrogenous nature, have to the writer's knowledge been responsible for exceptionally heavy losses among leghorn hens. No other treatment than mild purgatives and a change of diet is of any value.

Kidneys and Ureters.—The bird has two kidneys and two ureters. The kidney is divided into three distinct lobes each connected with the ureter. They commence from the rear of the reproductive organs, continuing one on each side of the spine to the rectum. They are elongated in shape, fitting themselves into the irregularities of the bony structure of the bird. The ureters continue along the surface of the kidney, ending in the lower portion of the cloaca. The kidney is not an organ frequently affected with disease, but cases of abscesses have been reported, while the prolonged feeding of food excessively rich in protein causes whitish areas and a general paleness of the kidney.

The heart is affected with several troubles, dropsy of the heart sac being by far the most frequent. The trouble, however, is not of a serious nature in flocks receiving the ordinary amount of care and attention. Rupture of the heart or large blood vessels also occurs occasionally in birds over-exerted or in their effort to escape capture. The trachea right and left bronchial tubes and right and left lung forms the principal parts of the respiratory system. Many of the troubles affecting these organs can be determined without postmortem examination, while congestion of the lungs, a trouble frequently affecting young birds and birds during the moulty period, is readily diagnosed by examination. With this trouble the engorgement of the blood vessels causes pressure upon the air cells, resulting in death from asphyxia, or there may be a rupture of a blood vessel which blocks up the bronchial tubes. Pneumonia is a stage beyond congestion; as well as congestion a liquid collects which by coagulating makes the lung more or less solid, rendering it useless as an organ of respiration. Another trouble is the development of a mould fungi which is

PLATE 71 (Fig. 3).—THIRD STAGE, WHICH EXPOSES INTERNAL ORGANS.

Plate 72 (Fig. 4).—Internal Organs of Hen.

(*See page 230 for Explanation of Block.*)

present in musty straw and grain. This fungi develops very rapidly in warm weather. Presence of this trouble is indicated by tubercular-like nodules varying in size from a pinhead to that of a pea in the tissue and even in the bones. On the lining of the air tubes a membraneous formation an eighth of an inch in thickness may be found. These patches are at first soft, but become firmer with age and yellowish in colour. The lungs of poultry, in common with other internal organs, are subject to general tuberculosis, but it has not been the writer's experience to encounter any case where the lung has been affected.

Peritonitis, inflammation of the peritoneum, the delicate membrane covering the abdominal cavity and the organs in that cavity, is another frequent cause of death. It is generally due to disorders of the liver, kidneys, or perforations of the intestines caused by worms allowing the escape of some of the intestinal content, or it may be caused through the septic condition arising from severe bruises or body blows.

From postmortem, therefore, a definite knowledge of the reason of losses can be secured which enables the breeder to take timely steps to prevent diseases of an epizootic nature from spreading. If the trouble be due to errors in feeding and housing have them rectified. Although poultry-keepers will not admit that the conditions under which they keep their fowls are responsible, they are in the main the predisposing cause for outbreaks of sickness. An ill-nourished, badly-housed, or wormy-infested flock offer little resistance to the inroads of disease organism. Once an outbreak of disease of an epizootic nature has occurred, a thorough clean-up of the premises should be made and disinfection practised. The runs should be ploughed in order to bury the excreta and parasites and bring fresh soil to the surface, but previous to ploughing, if it is possible to keep birds out of the pens, it could be dressed with a good coating of lime. Birds which are apparently sick should be either destroyed or isolated, and a careful watch kept upon the balance of the stock.

THE ANCESTRAL RECORD.

WHAT TO LOOK FOR IN HERD SIRES.

A Canadian editor tells us that pedigree is the ancestral record of an individual, but in purchasing a herd sire or breeding females the individual should be considered as well as the pedigree. A pedigree is good just in so far as the individuality and breeding qualities of the animals it represents are good.

It has been demonstrated times without number that a pure-bred sire is the cheapest sire a farmer can use, and at the present time they can be purchased at a price that should place them on every farm where a sire is kept. Grade sires may be good individuals, but there is no record of what is back of them.

While the blood of the immediate animal is most influential, yet an influence is exerted by the ancestors for several generations. Thus the importance of knowing something of the history of the herd sire purchased.

In dairy breeds it is not enough that the immediate dam has made a high record in any one particular year. It is of more importance to consider the records of the daughters of the sire of the bull you are buying and to determine what kind of production is back of his sire and dam.

In beef cattle show-ring performance of the immediate ancestors is given due consideration, but something should also be known about the commercial market qualities of near relatives in the ancestral line. After all, it is the utility end that counts.

There are some who lay great stress on certain families, and will pay considerably more for a member of that family than for one of another family, not because of individuality, but because it traces to a cow of that name a number of generations back.

The emphasising of certain families has been over-worked, yet there are certain lines of breeding that are much more valuable than others because close and careful observation has been exercised in building up a certain line of descent.

Family groups are built up by saving the best female progeny from the best breeding cows and mating them with the best sires that can be secured.

The members of these family groups are prized because of the individuality of each member of the group, and it is this that makes a valuable pedigree.

The bulls used in the development of a certain family must be considered as well as the female line of descent.

Because a pedigree traces to a certain animal eight or ten generations back does not necessarily make a good pedigree unless the individuality and utility of every individual represented in the line of descent are good.—"Farmer's Advocate," London (Ontario).

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

PART IV.

This is the fourth article of a series planned for the purpose of supplying information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep-raising in Queensland on comparatively small holdings.

LAMB RAISING ON THE COAST.

MIXED farming in Queensland has so far developed as to give rise to the question: Can sheep be raised successfully and profitably in combination with other farm activities?

Big changes have taken place in sheep-raising during our short history. When merinos were first introduced they were slow to improve and made little progress until they were tried on the drier inland pastures. There they have adapted themselves so thoroughly and have proved their superiority over all other breeds to such an obvious extent that we need not discuss their claims here. We find in every case, however, that any one breed of sheep has a tendency to evolve a distinct type, thus showing that environment plays a very important part in sheep breeding.

Knowing what has actually taken place in relation to our merinos in the localities in which they thrive, is it not also possible that the same success would attend other breeds or crosses were they tried out in our coastal country? We have breeds and crosses that have given very satisfactory results and that can be recommended with confidence, but there still remains much ground work to be performed in providing the most satisfactory breed or type for our "inside" country and the sea-coast. Past experience in this region was that sheep breeding was not altogether successful. There is no comparison, however, between the conditions existing then and now. The large holdings on which the sheep were run on the coastal side of the Main Range were mostly newly ringbarked forest flats or green timbered ridges; jungle or rain-forest lands not then being cleared or grassed.

The big holdings have since given way to smaller areas, and schemes of closer settlement have encouraged many men to try their lot on the land. This army of settlers, who follow, in the main, diversified farming, coupled cultivation with pasture and devoted time, energy, and capital to improve their holdings, making full use of the ridges for grazing to allow the richer flats to be put under the plough. Jungle has been cleared and put under introduced grasses. Roads have followed settlement; and drains cut where necessary to enable all surface water to drain off, leaving clean, sweet pastures.

These operations in themselves would bring about a vast improvement, and with our better knowledge of breeds other than the merino, the breed then used and bred purposely for wool, there is soundness in the belief that lamb-raising on the coastal country and nearer "inside" territory would be a profitable undertaking. At our command are the British mutton breeds which have already proved more or less adaptable to such an environment. These breeds have generations of breeding under somewhat similar conditions behind them and should prove most suitable in any mixed farming enterprise.

When we compare the price of wool and mutton fifty years ago with present day values and the values for the last ten years, it must be conceded that, even under the most favourable circumstances, sheep and wool growing in the "good old days" carried very small profits. That we are better organised at the present time as regards transport both by land and sea must also be readily admitted, while science in agriculture, feeding, and stock diseases has advanced to such a degree as to give a far greater security to the farmer than formerly.

When small owners commenced pioneering on their own holdings it was not unusual for them to sow a crop and then take up temporary employment while the crop matured. Successful sheep-raising in such circumstances would be impossible; therefore the conditions now are far more favourable for sheep-raising combined with mixed farming than ever they were in the past.

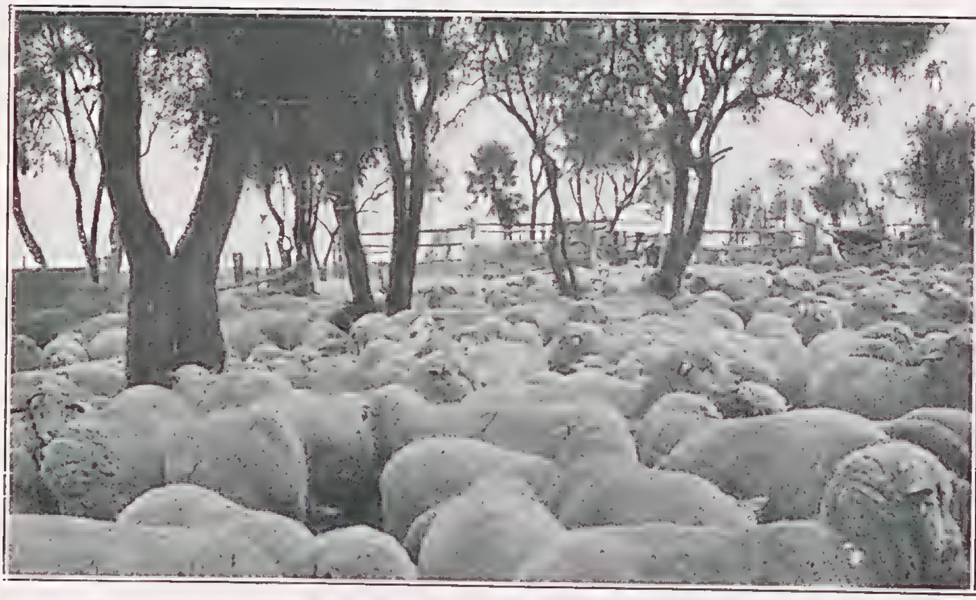


PLATE 73.—FARMERS' SHEEP.

A fine mob of merino ewes on a Queensland farm where wheat and sheep are a profitable combination.

PLATE 74.—A FARMER'S FLOCK IN NEW ZEALAND.

The male progeny of this fine mob of Southdown ewes will be mated with long-wool ewes (mostly Romney Marsh). The ultimate resuitant ram from this cross is considered, in parts of New Zealand, to be the right type of sire for the fat lamb trade.

Profits in the undertaking are the chief consideration. It is not advisable for those already in profitable enterprises to change for something they do not understand; but where any other combination is not proving satisfactory, and where soil and other conditions are suitable, I consider that sheep take pride of place as a side line on the farm.

On well grassed forest country or on jungle lands, laid down with couch, paspalum, or Rhodes grasses, sheep will do well in normal seasons. In seasons of heavy rainfall, when the growth of grass is rank, cattle are a decided advantage on a farm where a small flock is kept, for they eat off the tops and thus cause a stooling out of young shoots, which the sheep relish. On newly ringbarked country where rank grass is in abundance sheep will not thrive. That, together with the unsuitability of the merino to coastal conditions, was the trouble in the old days that gave rise to a general belief that sheep would not "make a do of it" east of the Dividing Range.

When sheep eat a paddock right out it should be spelled before cattle are run on it. This is when the subdividing fences are essential. If crops are grown, and in agricultural areas they should be, small paddocks, in which rotational grazing may be practised, become an important factor in the success of the undertaking. In our coastal areas we find conditions favourable for raising crops suitable as sheep food; and curiously enough the sheep suitable to these areas are also ready to take to and do well under these conditions.

In Britain the breeds are standardised, each locality having developed on lines suitable to its requirements principally from a mutton point of view. There they have a higher rate for mutton and markets close at hand. Their taste for prime being educated to a higher pitch, they are prepared to pay for it. Here we find our chief aim to be first for wool and second for mutton, but since the falling off in the price of wool the value of the carcass has become an important factor.

The pure British breeds are not our ideal, the wool of the long-wools being too coarse for our requirements and the Downs short-wools being deficient in length, quality, colour, and weight per fleece. It is, therefore, necessary for us to look for something that will give a finer wool than the long-wool breeds produce, and a longer, brighter, and better quality wool that will give a greater weight per fleece than the Downs breeds yield. These points will be discussed in the next instalment of this series.

[TO BE CONTINUED.]

BEGINNINGS OF AGRICULTURE.

The world, as known to the ancients, consisted of not more than half of Asia, and of a small part of Africa and Europe. During the inundation of the deluge a remnant of man, and of other animals, is related to have been saved on the top of the high mountain of Ararat, near the Caspian Sea, and, when the waters subsided, to have descended and multiplied in the plains of Assyria. As they increased in numbers they are related to have separated, and, after an unknown length of time, to have formed several nations and governments. Of these the principal are those of the Assyrian empire, known as Babylonians, Assyrians, Medes, and Persians, in Asia; of the Jews and the Egyptians, chiefly in Africa; and of the Grecians, chiefly in Europe. Least is known of the nations which composed the Assyrian empire; of the Jews, more is known of their gardening and domestic economy than of their field culture; the Egyptians may be considered the parent nation of arts and civilisation, and are supposed to have excelled in agriculture; and something is known of that art among the Greeks.

The history of agriculture among the nation is involved in impenetrable obscurity. Very few facts are recorded on the subject previous to the time of the Romans. That enterprising people considerably improved the art, and extended its practice with their conquests. After the fall of the Empire it declined throughout Europe, and, during the dark ages, was chiefly preserved on the estates of the church. With the general revival of arts and letters, which took place during the sixteenth century, agriculture also revived; first in Italy, and then in France and Germany, but it flourished most in Switzerland and Holland; and, finally, in recent times, has attained its highest degree of perfection in Britain. The modern agriculture of America is copied from that of Europe, and the same may be said of the agriculture of Australia and European colonies established in different parts of the world. The agriculture of China and the native agriculture of India seem to have undergone no change for many ages.

WOOL SHED EXPERTING PLANT.

INSTALLATION AT THE TECHNICAL COLLEGE.

STUDENTS attending the experting class in the Wool School, Central Technical College, have had, until now, to go to Sydney to complete their training in wool-shed machinery experting. By the installation of a new Wolseley two-stand shearing plant in the wool room, that disability has vanished. and Queensland students will be able to receive the highest technical training in their own State.

The college already has a modern wool scour, which has more than paid its way by the purchase and treatment of small flock owners' wool. Recently the Wool Advisory Committee suggested that an experting plant should be installed at the college, and C. H. Buzacott (Queensland), Limited, generously offered to present the college with a Wolseley two-stand plant. The firm has installed the machinery, which is of the latest type, and includes improvements up to the end of February, 1931. The firm has also agreed that its experts shall inspect the plant and instal any other modern improvements that may be brought in later. This will enable the students to keep themselves conversant with the latest developments in shearing plants, and will arm them with knowledge that will be of inestimable benefit to them in the future.

After inspecting the wool section of the College, the ceremony of switching on the plant was performed by the Premier, Hon. A. E. Moore, on Friday, 13th March, in the presence of a representative gathering of woolmen, and others interested in the pastoral industry.

At the request of the Principal, Mr. R. A. Wearne, and Mr. C. H. Jamieson, M.L.A. (representing Mr. W. A. Russell, M.L.A., a member of the Wool Advisory Committee), the Premier declared the plant open for instruction.

Speech by the Premier.

Mr. Moore said that greater knowledge in all sections of the wool industry was of vital importance. He had been impressed with the efficiency of the college, which was able to buy wool for instruction, treat it, and sell it at a profit. Sixty per cent. of Queensland's export values represented wool, and the rising markets gave them considerable hope; for one of the greatest calamities that could happen to the State was a collapse in the industry. Out of the present difficulties, however, might come good in the shape of a revivified fat-lamb industry, which, he thought, had been set back mainly because of high prices for wool.

HON. A. E. MOORE.

Beef Herd Improvement.

A scheme to spend £10,000 a year for five years was then announced by the Premier. He explained that the Empire Marketing Board had made available £5,000 a year for the five-years period, the Government would give £2,000, and graziers and other interests would contribute the other £3,000. The money would be spent through the Council for Scientific and Industrial Research. The Queensland Government had made available Gindi State Farm and Northern lands. Stock diseases would be the main line of investigation, but tests would also be made of crossing with Zebu cattle in an effort to evolve a tick-resistant strain that could be used in the Gulf country, where so much land was now lying idle. The artificial fertilising of pastures would also be investigated.

A Fine Training for Queensland Boys.

"The training the boys get here will have a far-reaching effect upon the industry," declared Mr. E. G. Parnell, a member of the Wool Advisory Committee. He said it was intended to extend the tuition to the classing and mating of sheep, expert knowledge in which would add many thousands of pounds to the industry.

Mr. R. D. Huish, managing director of Buzacotts (Queensland), Limited, promised that the plant would be kept up to date by his firm.

Proposing a vote of thanks to the Premier, the Superintendent of Technical Education (Mr. Leonard Morris) said that the college possessed the best wool-instruction plant in the Commonwealth.

Other speakers were Messrs. J. E. Walker, M.L.A., M. J. Kirwan, M.L.A., W. G. Brown (formerly Government Sheep and Wool Expert), and Sinclair Smith.

An inspection of the work carried out by Buzacotts' shows that it has been done exceptionally well. The machinery runs entirely without vibration, and is of the very latest pattern and complete with full equipment of handpieces, duplicate parts, and tools for the repair and adjustment of machines.

Plate 75.—Installation of Shearing and Experting Plant at Brisbane Technical College.

The Premier, Hon. A. E. Moore, is in the centre of the group, which includes representatives of pastoral and commercial interests and of the Departments of Public Instruction and Agriculture and Stock. Present day students are grouped in rear.

A SOLID-FLESHED TOMATO.

Mr. Paul Donnier, of Kelvin Grove, Brisbane, has supplied the following additional note on a new tomato, described in our last issue as a "New Fruit Tomato," which he has introduced and propagated with satisfactory results:—

This new variety of tomato (second year of its existence in England) was introduced by me into Queensland in August last. The seeds were sown in an old flower bed on 21st September without previously manuring the ground. In approximately three weeks the young plants were ready for transplanting. Germination of seeds was 100 per cent. The young plants grew at a wonderful rate, far beyond my expectations, and developed in a remarkably short time into a picture of health and vigour, and would have reached a height of 7 feet had they been allowed to grow unchecked. The fruit developed at an equal rate with the plants, forming clusters of from five to nine fruits on each cluster. The foliage is large and plentiful, well protecting the growing fruit. As to the fruit itself, it may safely be assumed as the perfection of a tomato from every point of view. The fruit is round, smooth-skinned (no corrugation whatever), going on an average three to four to the pound.

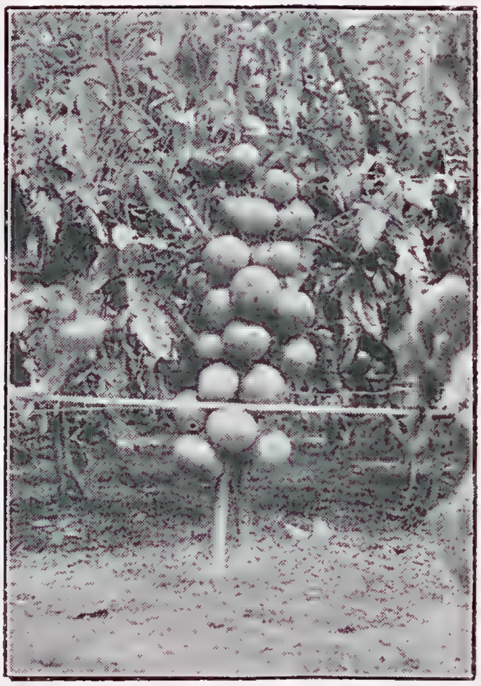


PLATE 76.—A TOMATO NEW TO QUEENSLAND.

The skin is of a very fine texture and may be peeled like the skin of a newly boiled potato. The core is very short. The flesh is solid right through, so that the tomato may be eaten like an apple, while in comparison to other varieties the seeds are few. Its travelling qualities also appear to be of an excellent character as, for instance: Picking several fruits just showing a reddish hue ten days before a local horticultural show, they were, at the date of the exhibition, just ripe for consumption. My crop of approximately 200 plants grown on very poor and shaley soil, yielded on an average 8 lb. to the plant; but, of course, better results can be expected when cultivated under more favourable conditions.

Many controversies have taken place over a point which may be of interest —i.e., can tomato plants be grown from cuttings? I have in my garden at the present moment a tomato plant in bloom grown from a pinched lateral which was stuck in the ground as an experiment.

DISEASES OF THE PIG.*

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

[*Continued from the January issue.*]

PART IV.

In the preparation of information dealing with Diseases of the Pig, an endeavour has been made to describe in the simplest language possible the various conditions, abnormal and otherwise, associated with the incidence or appearance of disease in swine. The suggested preventive measures and methods of treatment are such as may be successfully carried out by any careful farmer, excepting only in cases where the services of a qualified veterinarian are advised, and in these cases the best methods to follow will be suggested on the spot by the surgeon himself.

The pig is notoriously a bad patient and a difficult animal to handle when indisposed, hence great stress has been laid throughout this treatise on the necessity of preventive measures, for prevention is not only much better than cure, but is invariably less costly and a great deal more satisfactory.

In dealing with methods of treatment and the engagement of qualified aid, it has been realised there are numerous difficulties in the way, because Departmental officers or practising veterinarians are not always immediately available in town or country districts. Again, therefore, we stress that prevention is better than cure, and we might even qualify this further by adding prevention is more necessary than cure.

Mr. Shelton's bulletin, representing as it does much labour and the fruits of careful study and observation, is a welcome contribution to current pig literature.—EDITOR.

OTHER PARASITES.

INFESTATION by flies, fleas, mosquitoes, and bush ticks varies in its intensity in accordance with the care and attention given to pigs and by the environment in which they are kept. Stock kept on low-lying swampy areas are always liable to infestation by parasites, such as mosquitoes. Pigs kept in paddocks in which there is an abundant growth of blady or bush grass are liable to bush tick infestation, while pig paddocks and yards on dry sandy ridges are more liable to infestation by fleas, sandflies, and mosquitoes than by ticks.

These parasites may, to a large extent, be cleared out of the piggery if an ample supply of disinfectant solution is available and is sprayed regularly over the sty walls and around the food troughs, water pools, and wallows, and if the pens are kept clean and free from accumulations of filth.

---

* The typescript and illustrations of the Farmers' Bulletin on Diseases of the Pig have been submitted to the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., Department of Agriculture and Stock, Brisbane, Queensland.

Copies of the Bulletin may be had gratis on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

In the compilation of this paper the writings of recognised authorities in other States and other parts of the world have been drawn on, and the assistance thus received, also that freely given by other Departmental officers, is acknowledged gratefully.

An excellent skin dressing may be made up of buttermilk and flowers of sulphur; this will tend to soften the skin and put it into good condition. Repeated washings with lukewarm soapy water, and the application of coconut or other oil, or petroleum jelly, will always do an immense amount of good, even if the animals are not infested with parasites.

For ridding premises of fleas, a preparation well recommended is a mixture of 4 oz. of napthalene and 2 oz. of tobacco dust. Sprinkle this around the pens, sties, and sheds once weekly and so reduce infestation. A reliable insecticide to be used as a spray for the extermination of fleas and other pests, which also is useful as a household spray, is made up as follows:—One gallon of liquid ammonia, 4 lb. of best white soap, 8 oz. of salt petre, and 8 gallons of soft water. Handle very carefully. Have the soap chipped finely and pour the water over it, then boil until dissolved. Allow it to become cold, then add the salt petre and stir until dissolved. Strain, let the suds settle, skim off the dry suds and add the ammonia, and bottle and cork at once. This is an old-time recipe with a good reputation.

Another effective method is to spray heavily with kerosene emulsion after thoroughly cleansing the pens and ridding them of accumulations of cobwebs, rubbish, dusty bedding, &c. Walls and floors should be sprayed, and spraying should be repeated two or three times. If pigs are infested with fleas, they should be sprayed with the kerosene emulsion or washed with a 3 per cent. solution of creolin and water, or any other standard creosote compound. Kerosene emulsion should be made according to the following formulæ:—1 lb. hard soap, 1 pint kerosene, 1 gallon water. Boil water, add soap, and when soap is dissolved remove container from fire and allow to cool slightly, then add kerosene and stir well until emulsified.

The Bacon Fly and Bacon Weevil.

Other insects—perhaps of greater interest to the manufacturers, wholesalers, and retailers of bacon than to the breeder—are the bacon fly and bacon weevil. The bacon fly, *Piophila casei*, is a cosmopolitan pest, and is better known to the manufacturer and retailer in the larval form—the larvæ being commonly known as jumpers. (See note by Mr. Roberts in this issue.—ED.)

Besides bacon the fly will readily breed in cheese, dried fish, and even in carrion. At times it has caused severe loss in bacon factories, but may be successfully combated by screening and maintaining highly sanitary conditions. The bacon weevil (*Dermestes lardarius* and *Dermestes vulpinus*) are not thought to cause very much loss in stored bacon, though their presence has been frequently reported. Their hairy larvæ are also to be found attacking skins and similar stored products.

Itching of the Skin.

Technically, itching of the skin is known as Pruritis. Pigs infested with external or internal parasites always appear to suffer from an itching of the skin. Lice, ringworm, pox, fleas, mange, ticks, mosquitoes, nettlerash, sunburn, sunscald, each give rise to the condition, and they are all a source of annoyance to neglected stock that have not the benefit of a comfortable warm, dry shed in which to rest.

In all these cases careful observation will enable the farmer to gain some idea of the actual cause of the trouble.

Ringworm.

Ringworm is an affection of the skin caused by a vegetable fungus, technically known as *Trichophyton* (*tinea tonsurans*). It is not of great economic importance in well-kept piggeries, but spreads rapidly through a neglected herd. Ringworm is contagious. The disease may affect the person in attendance on the pigs, particularly if he attempts with his hands to remove the crusts or scales when treating the animals. The areas most frequently affected in the pig are the sides, back, belly, loin, and underside of the hams. In sows suckling litters the disease spreads along the udders and flanks and may be communicated to the young pigs. In appearance the effects of ringworm are not unlike severe sunscald. The affected areas are variably in size, usually about the size of a half-penny. They have a reddened, inflamed appearance, and towards the centre of the "ring" may be seen small bladders or vesicles (blisters) which burst and discharge a sticky fluid that dries off and crusts. It is the rubbing off of these crusts that carries infection to human beings and other animals on the farm.

Treatment.—Ringworm is not treated so readily in pigs as in the case of horses or cattle, hence stringent measures are necessary. Painting the affected areas is probably the most efficient remedy and has been effective when ointments and similar preparations have failed. Zinc ointment is useful and is usually effective, as also is a dilute solution of iodine. Preliminary treatment consists of carefully washing the affected areas with warm water and soft soap and drying these with a soft cloth before applying ointment or iodine. A 2 per cent. ointment of Chrysophanic acid or Goa powder and vaseline is the best and cheapest in the treatment of other animals, and where used no internal treatment is necessary.

In cases where a sow suckling her young is suffering with ringworm, it would be advisable to wean the litter before beginning remedial treatment. If this is not possible the young pigs should be watched very closely and be treated immediately any indication of the trouble presents itself.

Having regard to its infectious nature, a pig suffering with ringworm should be isolated until risk of infection has passed.

Breeding sows rearing large litters of pigs are subject to several affections of the udder, amongst which is *variola suilla*. It is an eruption, similar in appearance to cow pox, and as such may attack any part of the skin, but most commonly the parts devoid of hair, and particularly the teats and udders. It is rare and not of great economic importance, and does not cause any serious loss, apart from inciting irritability on the part of the sow when suckling her pigs. Ewes, cows, and mares are subject to a similar trouble, though in each instance it is known by different names (cow pox, sheep pox, horse pox, &c.). Apart from maintaining the animal in good condition by careful housing and by attention to diet and keeping the bowels and kidneys in good order, nothing need be done unless the ailment appears to be spreading, in which case washing the affected areas and painting them with a dilute solution of iodine daily should suffice. It is necessary to give the sow an ounce of Epsom salts and a teaspoonful of sulphur daily for a few days, in the slop food, and the udders should be washed with soap and water and kept clean. Generally speaking, the ailment is only of a temporary nature, passing off when the sow weans her pigs. In appearance it is not unlike ringworm, and might easily be diagnosed as this trouble in the absence of microscopic examination of scrapings from the affected areas.

[TO BE CONTINUED.]

DAIRY HERD IMPROVEMENT.

By CHAS. McGRATH, Supervisor of Dairying.

HERD production recording establishes a relationship between the quantities of butter-fat produced and the percentage of purebred and high-grade dairy stock constituting many of our dairy herds. The enthusiasm of the breeders has resulted in the establishment of high class pedigree dairy stock throughout the dairying districts of this State. Although high-class pedigree dairy cattle constitute a small percentage of our dairy stock, it can be said that the dairy sire and cow of definite breeding characteristics are to be met with in gradually increasing numbers in the far northern, central, and southern dairying sections. The influence of the bred-for-production pure sires is reflected in increased returns, both from purebred and grade dairy herds. A significant economic gain to the dairy industry must result from the raising of the standards of our grade dairy cattle and the replacement of grades by bred-for-production pure breeds.

Many dairymen, however, have not yet realised the urgent necessity of placing the better-class pure sire at the head of the herd and so ensure the breeding of better cows possessing a greater inheritance of butter-fat production characteristics. Increased production definitely determines the success or otherwise of the breeder's activities and makes the breeding of dairy cattle lucrative and fascinating.

As the number of breeders of bred-for-production pure breeds increase, an impetus is given to the demand for the better-class pure breeds, and keener competition and improved prices will result.

Many of the breeders of pure breeds are submitting their females for yearly test for entry in the advanced register of the Pure Breeders' Association conducted under the supervision of officers of the Department of Agriculture and Stock and the number is gradually increasing. Some remarkable production records have been made by individual females of each breed, creating an interest in the performance of daughters of certain dairy sires, and giving prominence to lines of blood that have greater inheritance for milk production. The herds of our successful stud breeders will supply the sires of daughters whose production will exceed that of their dams, and thereby increase the average production of the dairy herds of the State.

The percentage of purebred dairy cattle is low, however, and even with increasing interest in pure breeds, and the introduction of high-class dairy sires to head the grade herds, there is essential work to be carried out in the testing of the whole of the females constituting the herds so that the unprofitable cows may be discovered and eliminated.

Far-reaching benefits will result from recording of all purebred females and provide the information that will enable the breeder to remove from his stud all animals whose ancestry has not been bred generation after generation for economic production of butter-fat.

The replacing of the unprofitable cow unit of our dairy herds by individuals of higher production capacity will be a tremendous economic gain to the industry.

Generally dairy cattle-breeding is on a sounder and more progressive basis than ever before, and the future rate of progress is dependent in a great measure upon the work of the pure dairy cattle breeders in making available to dairy farmers high-class dairy stock.

That many of the stud breeders realise the value of production recording is evident from the regular entry of females from their herds into the advanced register of the Pure Breeders' Association.

Following are tabulated particulars of Departmental tests which tell their own tale.

21

TESTED HERDS.

Particulars of cows officially tested by officers of the Department of Agriculture and Stock. These cows have qualified for entry into the Herd Book of the Australian Illawarra Shorthorn Society, and the Jersey, Guernsey, and Holstein Cattle Societies of Queensland. The final tests were carried out during the months of November and December, 1930. (273 days periods unless otherwise stated.)

Name of Cow.	Age.	Milk Production.	Butter Fat.	Sire.	Dam.	Owner.
AUSTRALIAN ILLAWARRA SHORTHORN.						
		Lb.	Lb.			
Copper of Koh-i-noor	Senior (3 years)	11,110·35	503·956	Plums Laddie	Copper of Wyanga	A. E. Lawrence, Moregatta
Sparrow 4th of Lynfield	Mature	10,342·1	480·174	Dandy of Blacklands	Sparrow 3rd of Lynfield	H. D. Giles, Biggenden
Kitty IV. of Rhodesview	Junior (2 years)	6,866·903	248·827	Colonel Rose of Rosenthal	Kitty of Rhodesview	W. Gierke and Sons, Helidon
Dolly 5th of Greyleigh	Mature	10,635·609	373·879	Foch of Greyleigh	Dolly 3rd of Trevor Hill	M. C. Lester, Laidley Creek
Fancy 3rd of Railway View	Mature	8,571·5	378·364	Rufus Pride of Greyleigh	Fancy 2nd of Railway View	A. T. Waters, Lanefield
Polly 4th of Kingsdale	Junior (3 years)	6,751·65	288·413	Diamond Boy of Burradale	Polly II. of Kingsdale	A. A. King, Mooloolah
Empress of Werona	Mature	9,265·16	353·713	Young Kitchener of Burradale	Empress of Waughope	J. W. Johnston, Wooroolin
Trixy III. of Illawah	Junior (4 years)	11,416·915	413·205	Veteran of Greyleigh	Trixy of Illawah	B. C. Tuckett, Brookfield
Pretty Girl of Blacklands	Junior (2 years)	7,621·25	329·083	..	..	A. Pickels, Wondai
Rainbow 6th of Upton	Senior (4 years)	10,722·875	416·849	Kisma of Upton	Rainbow 3rd of Upton	W. F. Kajewski, Glencoe
Ethel 8th of Darbalara (263 days)	Mature	8,531·375	379·911	Kitchener of Darbalara	Ethel 2nd of Darbalara	Macfarlane Bros., Radford
Norah 3rd of Oakdale	Mature	8,898·25	381·574	Dandy 4th Chief of Greyleigh	Norah 2nd of Park View	W. F. Kajewski, Glencoe
Dandy's Togo Czarina 4th of Cedar Grove (265 days)	Junior (3 years)	7,682·6	348·001	Dandy of Ocean View	Togo's Czarina 3rd of Cedar Grove	A. C. Stewart, Wolvi
Lily 3rd of French View	Senior (2 years)	8,536·625	344·675	Chirnside of Thornleigh	Lily of French View	J. Lyndon, Worongary
Flora of Beechwood	Senior (3 years)	7,819·4	335·349	Royal Lad of Blacklands	Flora of Beechwood	F. W. Wooley, Millaa Millaa
Handsome 8th of Bri Bri	Junior (4 years)	8,815·75	339·522	Gay Boy of Tyrone Valley	Handsome 2nd of Bri Bri	W. Middleton, Camboova
Gipsy II. of Springdale	Junior (4 years)	9,997·95	412·740	Reward of Springdale	Gipsy of Springdale	B. C. Tuckett, Brookfield
Duchess x of Springdale	Mature	10,523·35	397·403	Lovely's Commodore of Springdale	Duchess 2nd of Springdale	B. C. Tuckett, Brookfield
Flirt III. of Brundah	Mature	10,871·725	414·163	Thor of Greyleigh	Flirt of Brundah	B. C. Tuckett, Brookfield
Melba of Trevor Hill	Junior (2 years)	8,741·241	326·462	Prince of Braemar	Princess of Trevor Hill	G. Gwynne, Umbiram
Primrose of Eacham Vale (228 days)	Mature	12,585·85	546·69	Pyree Boy of Pyree	Mayblossom of Eacham Vale	J. K. English, Malanda
Duchess XIV. of Springdale	Senior (2 years)	10,089·8	358·494	Don of Springdale	Duchess 9th of Springdale	V. Dunstan, Wolvi
FRIESIAN.						
Winana Colantha 2nd of Ryfield	Mature	11,115·595	459·759	Bell De Kol Ongarue	Winana Colantha of Ryfield	P. P. Falt, Tingoora
Dairymaid 4th of Oaklands	Junior (3 years)	10,671·25	421·722	Price Colantha 2nd of Ryfield	Oaklands Dairymaid 2nd	W. Richters, Tingoora

TESTED HERDS—*continued.*

Name of Cow.	Age.	Milk Production.	Butter Fat.	Sire.	Dam.	Owner.
				JERSEY.		
		Lb.	Lb.			
Zenobia's Golden Princess of Woodstock	Mature	6,602·5	372·623	Golden Jolly	Princess Zenobia	C. F. Klaus, Mundubbera
Inasfayl Romance	Mature	7,131·1	361·151	Norwood Model	Innisfail Babbette	McGeehan Bros., Kairi
Inasfayl Ebony Lass	Junior (3 years)	5,531·2	284·017	Norwood Model	Innisfail Ebony	McGeehan Bros., Kairi
Britannia of Rosehill	Junior (2 years)	5,650·7	319·588	Raleigh's Lad of Rosehill	Queen of Rosehill	J. F. Burnett, Harrisville
Kelvinside Favourite Narcissus	Junior (3 years)	6,478·05	314·721	Springmead Tarzan	Favourite's Fuchsia of Kelvinside	J. and R. Williams, Glencliff
Kelvinside Creamy's Cleony	Senior (2 years)	6,808·25	333·632	Springmead Tarzan	Creamy of Oaklands	J. and R. Williams, Glencliff
Tot of Burnleigh (365 days)	Junior (2 years)	8,480·0	453·372	Noisy Jim of Burnleigh	Trixie of Burnleigh	Chas. Klaus, Mundubbera
Butterfly of Rosehill	Junior (2 years)	4,937·25	253·712	Raleigh's Lad of Rosehill	Talgai Madeline	T. Gillespie, Ravenshoe
Favourite's Fern of Brooklands	Mature	7·773·5	375·648	Golden Fern's Idyl	King's Favourite	W. S. Conochie, Sherwood
Pineview Rosina	Senior (2 years)	5,086·5	310·83	Oxford Renown	Pineview Golden Gem	J. Hunter and Sons, Borallon
Dot of Hamilton	Mature	7,547·75	403·798	Larkspur's Oxford	Countess of Hamilton	J. W. Evans, Boonah
Glengariffe Noble's Velvet 2nd	Mature	6,673·6	398·487	Glengariffe Noble's Hereward	Glengariffe Noble's Velvet	Cox Bros., Maleny

DEPARTMENTAL HERD TESTING SCHEME.

FREE OF COST TO THE DAIRYMAN.

The Herd Testing Scheme under the control of the Department of Agriculture and Stock offers to dairy farmers an excellent opportunity of testing individual cows in their herds, so that unprofitable cows may be culled and the efficiency of the dairy farmers' operations improved.

In order to arrive at the productive value of each cow it is essential that the record shall extend over a period of at least 273 days. During this period the dairy farmer is required to weigh and sample the milk of each cow at intervals of sixty days.

On receipt of an application a case containing the required number of sample bottles is forwarded to the dairy farmer who records the production of each cow over a period of forty-eight hours, and takes a sample of each individual cow's milk. The records and samples should be then returned to the Herd Testing Section, Department of Agriculture and Stock, Brisbane.

When the lactation period is completed the records of each individual cow submitted are computed, and the records of the herd are forwarded to the individual dairyman.

A perusal of the herd records will enable the dairy farmer to determine the returns from each cow tested, and allow of the culling of the "boarder." The following record of two herds that have just completed a lactation period indicates that the use of the scales and Babcock test is essential in securing efficiency in the industry.

At the beginning of this season upwards of 12,000 cows were undergoing a production test, and it is hoped that the number will soon be considerably increased.

RECORD OF A GRADE HERD, YEAR 1930.

Name of Cow.	Date of Calving.	Yield for 273 Days Lactation. Milk.	Butterfat.	Value at 1s. 6d. per lb.
		Lb.	Lb.	£ s. d.
Charm	..	5,736	251	18 16 6
Granny	..	4,098	190	14 5 0
Matilda	..	5,419	312	23 8 0
Stumpy	..	5,162	261	19 11 6
Pearl	..	5,729	214	16 1 0
Peggy	..	3,901	185	13 17 6
Nancy	..	3,172	207	15 10 6
Daisy	..	3,638	186	13 19 0
Snowy	..	4,214	168	12 12 0
Lovely	..	3,503	165	12 7 6
Star	..	5,405	229	17 3 6
Lady	..	3,056	104	7 16 0
Tiny	..	5,055	239	17 18 6
Hope	..	6,153	302	22 13 0
Brindle	..	3,714	194	14 11 0
Bessie	..	5,187	267	20 0 6
Roney	..	7,771	386	28 19 0
Silver	..	5,026	227	17 0 6
Duchess	..	5,325	234	17 11 0
Poley	..	5,483	222	16 13 0
Lucy	..	5,327	260	19 10 0
Sunshine	..	4,956	214	16 1 0
Pansy	..	5,173	224	16 16 0
Bell	..	4,985	233	17 9 6
Nellie	..	4,479	203	15 4 6
Beauty	..	4,837	259	19 8 6
Jean	..	5,606	211	15 16 6
Leopard	..	6,653	270	20 5 0
Butterfly	..	5,528	216	16 4 0
Total for 29 Cows	..	..	..	£497 9 6
Average per Cow	..	..	..	£17 3 0

RECORD OF A PURE BRED HERD, YEAR 1930.

Name of Cow.	Date of Calving.	Yield for 273 Days Lactation.		Value at 1s. 6d. per lb.
		Milk.	Butterfat.	
		Lb.	Lb.	£ s. d.
Lady	1 July, 1929	9,065	381	28 11 6
Bella	14 Feb., 1929	8,640	356	26 14 0
Carnation	3 Nov., 1928	6,583	238	17 17 0
Cherry	14 June, 1929	9,380	314	23 11 0
Dolly	18 May, 1929	7,471	284	21 3 0
Diamond	7 July, 1929	11,342	399	29 18 6
Fashion	18 Apr., 1929	6,401	249	18 13 6
Mona	12 Feb., 1929	7,553	297	22 5 6
Melba	23 May, 1929	8,827	339	25 8 6
Nora	16 May, 1929	9,303	369	27 13 6
Rosie	22 June, 1929	7,976	289	21 13 6
Rainbow	8 Apr., 1929	8,080	302	22 13 0
Rosetta	24 May, 1929	9,654	347	26 0 6
Snowie	3 Apr., 1929	9,277	375	28 2 6
Sussie	17 June, 1929	7,965	335	25 2 6
Violet	18 May, 1929	6,171	251	18 16 6
Lily	2 Oct., 1929	7,004	268	20 2 0
Polly	22 Sept., 1929	6,755	260	19 10 0
Queenie	28 Sept., 1929	11,076	362	27 3 0
Total for 19 Cows	..	..	..	£450 19 6
Average per Cow ..	..	..	..	£23 15 0

Further information may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

"TB." IN COWS.

That a stage has been reached when it appears to be definitely practicable to make cows immune from tuberculosis is stated by the Empire Marketing Board in a review of research work at Cambridge and at the Ministry of Agriculture's laboratories at Weybridge. Professor J. B. Buxton and Dr. Stanley Griffith have been working at Cambridge, under the auspices of the Medical Research Council and the Marketing Board, on a special vaccine known as "B.C.G." or Bacillus Calmette-Guerin, so called because it was discovered by Professor Calmette in 1906. It is stated that a cow which was vaccinated with B.C.G. as a heifer and subsequently inoculated with tubercle germs had given birth to a calf which, though it was reared by its mother, did not react to the standard test for tuberculosis, and so was free from infection.

"Other animals vaccinated with B.C.G. were slaughtered over a year after inoculation with enough tubercle germs to kill 'control' calves in a few weeks, and their resistance to infection was so high that they were found to be suffering only from slight chronic symptoms of the disease."

"Many more years of work," it is said, "are necessary before B.C.G. can be regarded as an established immuniser. No one knows, for instance, how long its effects last, and whether the vaccination would have to be repeated at intervals, as with smallpox immunisation in man. This work is of vital importance not only to farmers, but also from the standpoint of human health. Human beings are susceptible to bovine tuberculosis, and about 30 per cent. of tuberculosis of the bones and joints is caused by the bovine germ."

OBITUARY.

MR. H. W. POTTS.

The death occurred at Innisfail on 13th February of Mr. H. W. Potts, F.C.S., F.L.S., Commissioner for Malta, whose headquarters were in Sydney. Mr. Potts held a high reputation throughout Australia as an agricultural scientist. Born in Northumberland, he first arrived in Brisbane in 1873, being then a qualified agricultural chemist and botanist. He was employed subsequently by the Victorian Government as agricultural scientist in the organisation of the first butter factory in Australia, chiefly in teaching the managers the application of science to dairying. In 1902 he accepted the position of Principal of the Hawkesbury Agricultural College, at Richmond, New South Wales, and during the nineteen years he remained there he established a reputation which extended throughout the Commonwealth and even to other countries. He retired in 1920. Since then he had been five years in England as a principal of the Australian Farms' Training College at Lyndford Hall, Norfolk. Following the accidental burning of the hall, it was decided not to rebuild it, when Mr. Potts carried the property on as a stock farm, until last December. Lord Strickland, the Premier of Malta, asked the late Mr. Potts to report on the agricultural and live-stock conditions existing on that island. Lord Strickland also invited him to be Commissioner for Malta for the whole of Australia, which position he occupied at the time of his death. The deceased gentleman was held in high esteem by the 5,000 Maltese in Australia.

The late Mr. Potts was a prolific writer on live stock and agricultural subjects. He was editor of the "Australian Cotton Journal" and of the "Hawkesbury Agricultural College Journal." His book on "Pigs and their Management" is the text-book on the subject. He also edited the first journal of agriculture for the Victorian Government. From 1896 to 1899 he was a member of the Victorian Royal Commission on Education, which reorganised the whole of the educational services of Victoria. The late Mr. Potts is survived by a widow, three sons—Messrs. George Potts (Leeton, New South Wales), Garnsey Potts (Brisbane), and Frampton Potts (Mudgee, New South Wales)—and two daughters, the Misses Unee and Colina Potts (Cremorne, Sydney, New South Wales).

MR. H. W. BECK.

Mr. Henry William Beck, formerly Stock Inspector of the Agriculture and Stock Department, passed away at his residence, Rutherglen, Indooroopilly, on 25th February. The late Mr. Beck was born in London in 1847, and sailed from there in the "Queen of the Colonies" on 13th June, 1865, arriving at Brisbane in September of the same year. From Brisbane he went to the Wide Bay and Burnett districts to engage in station work. In the year 1871, at Rockhampton, he married Ellen Carey, daughter of the late John William Carey, who was a foundation member of the first bowling club formed in Brisbane, and also of the Booroodabin Club. In 1874 he was appointed quarantine-keeper to the Department of Agriculture and Stock, Brisbane district, the first quarantine station being then situated at Highgate Hill, South Brisbane. On its removal to Indooroopilly, Lytton, and Colmslie, he served at those places successively. While at Lytton he was gazetted as an inspector of stock. Altogether he served forty-seven years in the department, and at the time of retirement was its oldest officer. He was regarded as a conscientious, capable, and painstaking man, and some of the most valuable imported cattle, horses, and sheep passed through his hands. He had resided at Indooroopilly for the past ten years, and left a widow, four sons, three daughters, thirty-four grandchildren, and two great-grandchildren.

CLIMATOLOGICAL TABLE—FEBRUARY, 1931.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	29·83	90	75	100	8	70	23	912	13
Herberton	..	84	65	93	9	59	21, 28	369	6
Rockhampton	29·85	88	71	96	9	65	23	889	8
Brisbane	29·93	82	67	90	21	59	23	1909	13
Darling Downs.									
Dalby	29·94	84	62	90	20, 21	49	23	615	4
Stanthorpe	..	77	58	87	20	41	23	332	7
Toowoomba	..	77	60	87	21	46	22	879	10
Mid-interior.									
Georgetown	29·82	97	74	102	9	68	25	318	5
Longreach	29·83	103	73	108	8, 9, 10	62	22, 23	8	1
Mitchell	29·91	93	68	100	20	48	23	15	2
Western.									
Burketown	29·81	98	77	104	5, 9	71	24	13	1
Boulia	29·81	105	76	111	10, 11, 20	61	22	0	0
Thargomindah	29·86	97	75	104	9, 16, 20	59	22	0	0

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING FEBRUARY, 1931, AND 1930 FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Feb.	No. of Years' Records.	Total Rainfall. Feb. 1931.	Feb. 1930.
North Coast.	In.		In.	In.
Atherton	10·38	30	4·87	17·26
Cairns	15·49	49	14·60	13·74
Cardwell	17·11	59	11·77	17·67
Cooktown	13·59	55	9·12	19·13
Herberton	7·72	44	3·69	9·59
Ingham	16·56	39	5·49	18·04
Innisfail	22·46	50	15·98	14·98
Mossman	18·35	18	4·76	34·27
Townsville	11·40	60	3·50	7·69
Central Coast.				
Ayr	9·10	44	5·18	4·12
Bowen	8·84	60	4·23	6·89
Charters Towers ..	4·49	49	2·23	3·41
Mackay	11 47	60	6·48	5·62
Proserpine	12·39	28	6·26	13·00
St. Lawrence.. ..	8·00	60	4·77	4·96
South Coast.				
Biggenden	4·33	32	8·85	3·54
Bundaberg	6·19	48	23·77	5·00
Brisbane .. .	6·41	80	19·09	1·81
Caboolture .. .	7·37	44	34·24	3·85
Childers .. .	6·55	36	14·42	4·02
Crohamhurst ..	12·93	38	32·17	9·28
Esk .. .	5·44	44	13·32	6·57
Gayndah	4·31	60	4·68	3·51
Gympie ..	6·64	61	14·61	5·64
Kilkivan	5·00	52	5·83	4·27
Maryborough .	6·41	59	23·56	5·00

Divisions and Stations.	Average Rainfall. Feb.	No. of Years' Records.	Total Rainfall. Feb. 1931.	Feb. 1930.
South Coast—continued:	In.		In.	In.
Nambour	9·48	35	23·08	5·76
Nanango	4·16	49	6 92	2·35
Rockhampton ..	7·91	44	8·89	4·39
Woodford	8·39	44	21·12	5·11
Darling Downs.				
Dalby	2·84	61	6·15	1·23
Emu Vale	2·60	35	2·36	1·22
Jimbour	2·64	43	4·93	2·00
Miles	2·77	46	3·11	1·49
Stanthorpe	3·28	58	3·32	1·36
Toowoomba ..	4·51	59	8·79	4·26
Warwick	3·13	66	2·78	2·05
Maranoa.				
Roma	3·03	57	2·36	0·30
State Farms, &c.				
Bungeworgorai ..	2·39	17	1·36	0·20
Gatton College ..	3·34	36	6·64	3·56
Gindie	2·94	32	0·10	0·85
Hermitage	2·60	25	2·22	1·55
Kairi	9·91	17	5·53	8·18
Mackay Sugar Experiment Station ..	10·48	34	5·32	4·38

GEORGE G. BOND, Divisional Meteorologist.

TEMPERATE FRUITS IN QUEENSLAND.

The Minister for Agriculture and Stock, Hon. Harry F. Walker, has received the subjoined report on the cultivation of temperate fruits in Queensland from Mr. Geo. Williams, Director of Fruit Culture.

TEMPERATE fruits have a fairly wide distribution over the colder parts of the southern inland division of the State, but commercial production is almost entirely confined to the Granite Belt, where the majority of the orchards are of comparatively recent establishment. Over fifty years ago the Toowoomba district produced in very limited quantity excellent fruit of several varieties, particularly apples and pears. Later commercial plantings were undertaken by a few enthusiastic persons in the Stanthorpe district, where the industry has gradually expanded until the production, as given in latest returns available, is valued at £350,000 per annum. In the meantime the results have not always been encouraging, and many failures, partial or complete, have been experienced. Contributing factors have principally been: Planting in unsuitable soil, unprofitable varieties and others not adapted to local conditions, inadequate attention, pests and diseases, and inferior nursery stock.

Fruitgrowing in the Granite Belt.

The variations at short intervals in the condition of the soil contained within the Granite Belt are very marked; instances where 20 acres or over of an even formation of fruit land exist are rare. Areas of 10 to 15 acres almost invariably show defect in part or parts. The best local soil is of granitic origin, fairly free, and of good depth, and in this stone fruits, as well as other kinds, also grape vines, luxuriate; but unfortunately such land is usually accompanied or interspersed with soils of shallow depth over a subsoil generally referred to as cement, or rock basins, at shallow depths. There being no possibility of soil aeration except to a very shallow depth, the roots become cramped and their fibres are destroyed during extended periods of wet weather. The average temperature of the soil is most equitable at a depth of about 2 feet. In climates with such a wide range of temperature as that experienced in the Granite Belt, shallow rooting, which predominates, renders the roots liable to the effect of excessive heat during the hot months of the year, and the effect of cold during the winter. The natural corollary of this is stunted or dwarfed trees, and where it cannot be or is not overcome the distances between trees can be most appreciably reduced.

In the absence of congenial soil conditions, the application of cultural methods, fertilizers, &c., shows but modest results. In many places where orchards have been situated that are now defunct the natural conditions are such that their profitable working is practically impossible. This may be also applied in parts to numerous existing orchards. In the majority, draining is essential. The particular area may be small or extensive. Agricultural pipes are utilised for the purpose, but their price is now prohibitive except where small plots are being dealt with. Stones properly placed make an efficient substitute, but entail much labour in collecting, handling, and placing, and also in the quantity of excavating necessary for their reception.

The space between the drains (which should not be less than 3 feet deep) varies somewhat according to the texture of the soil, but 20 to 35 feet apart is recognised as being reasonable limitations. It has been noted that in many of the Stanthorpe orchards patches of ill-drained soil of varying dimensions and shape exist. Indication varies as to the extent to which excessive moisture may be present and the term of its duration. Land which becomes excessively wet during the wet season invariably becomes hard and dry and practically impervious during the dry months. In some cases it may be possible to remedy this natural defect by one or two drains; in others many would be required. Where a rock basin or bank is the means of holding back the water, it may sometimes be necessary to cut through this to the necessary depth to allow for the escape of water, though any difficulty usually may be overcome by slight deviation. To more accurately determine alignment of drains, where loose stones are not appreciably present, a soil auger may be used for a preliminary survey, and under wet conditions a light crowbar will be more satisfactory. So far as soil improvement applies in this district, draining, where necessary, takes preference over all other methods that can be applied. The effect of ill-drained land upon

the roots of different trees varies considerably, those of the peach being particularly susceptible. No system which can be applied to land will bring it to an equal state of that where the required conditions are provided by nature, but the position may be so ameliorated that the cost is considered warranted.

In following upon, in many cases, unsuitable soil to start with, the selection of varieties was rather indiscriminate, there being really nothing as a guide in this important aspect, experience being practically nil, consequently planters selected a variety which appealed to them either from acquaintance with the fruit or published descriptions. Frost injury, susceptibility to disease, vigour, and general adaptability could not be determined, chance alone being relied upon.

Stocks were subsequently found to exercise a very important influence upon the development of the trees, and though satisfactory results have in some earlier instances attended the use of the Northern Spy apple, it has not on the whole been a success. It has a tendency to produce clusters of small fibrous roots, which are most pronounced particularly in the shallower soils. This form of root growth is detrimental, and the development of a moderate root system where it prevails is seldom present. Following upon the use of the Paradise stock for general use, the adoption of the Northern Spy became almost universal, mainly on account of its being described as blight-proof or immune to the attacks of Woolly Aphis. The demand for this particular stock would appear to have resulted in its general depreciation, due no doubt to quality giving place to quantity and the application of the most rapid means of propagation. The constitution thus became impaired, and the undesirable tendency in having the root system more pronounced.

The most suitable apple stock for the district is still undecided, though it is ceded that in most of the States seedling stocks or hardy commercial varieties are the most satisfactory. Vegetative stock of different origins have commanded much attention during the last few years, and have advocacy from authoritative sources; but confliction of opinion exists and will so continue. Different systems or methods must be varied to meet the conditions of general environment, and it is probable that no definite pronouncement on the subject will ever receive universal approval.

In some instances where special attention has been applied to stocks over a number of years, it is expected that the influence of the stock upon the grafts is the sole factor; but opportunity is taken of expressing a contrary opinion, that the head of the tree exercises, according to its natural habit, a most marked influence upon the stock, a bushy tree of dense growth will induce the formation and maintenance of numerous fibrous roots, where an open habit of growth, and more particularly where this has a vertical tendency, it will be found to show very much less fibre, but longer and comparatively bare roots.

One cannot but express regret that the orchard established in connection with the soldier settlement on soil of varying consistency and containing an extensive collection of trees and grape vines should have been relegated to oblivion. In the absence of such an institution perhaps more could have been expected from individual or collective effort, particularly in the direction of establishing a nursery for the supply of local trees for planting, instead of relying on importations which were frequently of most indifferent quality. The unsuitability of certain apple and other fruit tree stocks has been determined; time and effort only can determine the most suitable types and varieties for local production.

Among stone fruits soil influences are very important. The use of peach stocks in sour or badly drained land is fatal, and it is suggested that the appearances of mould when conditions favour their development can to a great extent be ameliorated by giving more regard to the class of soil in which trees are planted or to its drainage, it being recognised that moulds are harboured by dead or dying wood, which will ever be more or less present where drainage is deficient, and much more evident in some varieties than in others. Stocks suitable for plums are a subject of concern. The range of choice is limited, and trials of different kinds should be conducted on similar lines on a number of soils. Otherwise they cannot be accepted as being generally applicable to the district.

Selection of Varieties.

Regarding varieties, selectors have now the opportunity of advice from the local Departmental officers, whose observations cover the whole of the district, and who are consequently intimately conversant with the suitability of such varieties as it may be desired to include. This advice should be availed of. The choice should be guided by two factors—adaptability to local conditions and market requirements. The longevity of the tree under existing conditions must be considered in respect of adaptability, also the possibility of a crop being destroyed in its

early stages by light frost. The former applies particularly to plums, and, although the latter applies generally to early fruits, the apricot is outstanding. Frost injury is a danger present every season, as is also hail damage. Insurance against the latter has been frequently discussed without result, and it would appear that the loss from both cases must remain with the individual. Against frost injury various recommendations were received, particularly in respect of smoke-screens, but in all of these the fact that heat and not smoke was the actuating influence was not appreciated. A limited number of smoke bombs were imported from France, but the result of their use was innocuous. Rockets containing explosive for use in the dispersal of hail clouds were also introduced, but so far there has been little occasion for use. Tangible results in any case cannot be anticipated.

Pests and Diseases.

Fruit fly in varying quantity has been present in the Stanthorpe as well as other fruitgrowing districts, practically ever since cultivated fruit was available for it to deposit its eggs in. Woolly Aphis, Codlin Moth, scale insects, and Peach Aphis are later introductions. The former has in numerous seasons made very serious inroads on orchard returns. With the advent of rigorous application of the Diseases in Plants Act, re-collecting and destroying infested fruit, based upon a much earlier but practically unaccepted recommendation, the menace has been very much reduced. The fallacy that the pest was to be disposed of by one fell sweep, and that it was not migratory, was forcibly demonstrated the year following its pronouncement. The local Entomologist, Mr. Jarvis, conclusively proved that the pest did not winter in the orchards, and has subsequently very materially added to control measures by perfecting an inexpensive lure by which the adult flies are readily induced to encompass their own destruction. The results of investigations conducted by Mr. Jarvis have been most helpful to the fruitgrowers by whom they are fully appreciated, as are also those of the local instructor, Mr. Pratt, and his staff. For the introduction of Aphilinus, which has so successfully combated that previously ruinous pest, the Woolly Aphis, growers have also to thank Mr. Jarvis. Codlin Moth still continues to take a varying toll of the fruit, as it does in all lands where pomaceous fruit are included and the pest exists. Luring the adult moth has for some time received consideration, and recent reports suggest this as being a satisfactory method. Scale insects also aphides are kept in complete subjection, except in such places as are from time to time found to be in a neglected condition, by spraying. Neglected orchards have from the past been far too frequent, and the cause of the dissemination of pests and diseases. With wider powers now conferred on the inspectors their elimination is progressing. In respect of diseases the district is most fortunate in remaining so far free from infestation by Black Spot of apples and pears, and the close application of the regulations governing the introduction of Southern fruit into the district should materially assist in maintaining it so. Unfortunately Crown Gall has been introduced, but its presence is not considered by any means general. Brown Rot of stone fruits is persistent under humid conditions, also other forms of fungi less pronounced in effect but worthy of further investigation. Grape culture has expanded to pretentious dimensions. Generally the conditions are favourable as to the quality and abundance of yield, as the supplies received from the district amply testify. The firm-fleshed berry suitable for distant transport may be retained in cool stores. It is represented in several excellent varieties, as are also the most popular muscats. With the increased production consideration is being given to extensive export. For this purpose only the former type is suitable, and as an absorbent material for packing, cork dust is considered the most satisfactory. The quality, size, and general appearance of the fruit, particularly when matured under dry conditions, as it must be for satisfactory export, are unexcelled in any part of the Commonwealth. The necessity for spraying vines against fungi, which is of paramount importance on the coast, is reduced to a limited number of applications; but this must be supplied for the suppression of both Downy Mildew and Black Spot.

Reconditioning of Orchards.

This must receive attention where the trees are not reasonably developed and productive. In most cases the owner could not entertain the idea of treating more than a small portion of his orchard annually; but it is obvious that all-round improvement cannot be effected by other means. Following soil improvement, the elimination of stagnant trees and replanting under improved conditions must first be considered. Many trees will retain sufficient vigour to warrant attention. The amputation of much of their root growth must be balanced by the reduction of the head proportionately. In replanting, lessening the distance between trees might well be considered.

Summary.

Summarised, the principal features in connection with the industry for consideration are:—Selection of orchard sites; more consideration is necessary before selection, with provision made at the outset for draining where required; shallow soils otherwise should not be considered. Varieties:—Plant only a limited number of kinds of known quality and productivity under local conditions. If experimentation is desired, limit the number of kinds or of plants to two or three of each; the experimental part of an orchard is rightly looked upon as unprofitable. Planting:—Do not plant land that is unsuitable or that which has not been properly prepared. Planting on the square system is recommended. Be advised by your local instructor regarding the distribution of varieties for interpollination, after following his advice in respect of site and soil preparation. Plant one-year-old trees in preference to stags. Standards are now prescribed for fruit trees for planting; see that those supplied to you comply with these standards. Subsequent attention:—If growing green crops or weeds, in starting trees in the same land keep the two separate. It is not easy to locate the young tree when closely surrounded by other growth, and as its development under such conditions will be nil, it may be entirely lost. Recollect that in intercropping the collected produce leaves the land so much poorer. Instead of depleting land in this way, fertilize and grow a green crop for ploughing in before recropping. This will be of mutual and general advantage. Your land may be rich in potash, but this alone will not stimulate growth. In suitable, well-worked soils the trees will respond to good treatment, but will also show an adverse effect where the conditions are indifferent. Complete every operation thoroughly and, though exceptional circumstances may on some occasions prevent it, have them completed on time. Delay often means disaster. The completion of operations successfully cannot be obtained where one endeavours to encompass too much. Restrict the area to that commensurate with your capabilities. Systematic attention and efficient working over a reasonable area will give a much higher monetary return than equal energy expanded over a wider field. Intercropping is mainly practised with the object of contributing to the wherewithall until the trees attain a profitable age, tomatoes and various vegetables being used for the purpose. The fertilizer requirements of each should be considered, and applied prior to planting, though nitrogenous fertilizers may also be beneficially applied as a top dressing to such crops as profit thereby. Consult the bulletin by the Agricultural Chemist, ''Complete Fertilizers for Farm and Orchard,'' and follow the directions given. Do not take it for granted that the one general fertilizer will answer equally for, say, tomatoes, beans, and cabbage, also that the requirements of the trees may be similarly met by injudicious fertilizing. Indiscriminate applications are seldom profitable. Do not hesitate to invoke the aid of advice of your instructor, even on what you may consider trivial matters. It is his pleasure to advise and assist in every way possible.

QUEENSLAND SHOW DATES, 1931.

Oakey: 11th April.
Goondiwindi: 10th and 11th April.
Dalby: 15th and 16th April.
Chinchilla: 21st and 22nd April.
Goombungee: 22nd April.
Miles: 29th April.
Beaudesert: 29th April to 2nd May.
Taroom: 4th to 6th May.
Murgon: 7th to 9th May.
Boonah: 6th and 7th May.
Mundubbera: 6th and 7th May.
Ipswich: 12th to 15th May.
Mitchell: 13th and 14th May.
Atherton: 21st and 22nd May.
Roma: 19th, 20th, and 21st May.
Kilkivan: 20th and 21st May.
Biggenden: 21st and 22nd May.
Kalbar: 23rd May.
Emerald: 20th and 21st May.
Maryborough: 26th to 28th May.
Marburg: 2nd and 3rd June.
Wowan: 4th and 5th June.
Lowood: 19th and 20th June.
Mount Larcom: 19th and 20th June.
Rockhampton: 23rd to 27th June.
Kilcoy: 2nd and 3rd July.
Home Hill: 3rd and 4th July.
Townsville: 7th to 9th July.
Gatton: 8th and 9th July.
Cleveland: 10th and 11th July.
Caboolture: 16th and 17th July.
Rosewood: 17th and 18th July.
Ithaca: 18th July.
Laidley: 22nd and 23rd July.
Esk: 24th and 25th July.
Maleny: 29th and 30th July.
Royal National: 10th to 15th August.
Wynnum: 28th and 29th August.
Imbil: 2nd and 3rd September.
Beenleigh: 18th and 19th September.
Rocklea: 26th September.

HOME-MADE CHEESE.

METHOD OF MANUFACTURE.

By C. F. McGRATH, Supervisor of Dairying.

TAKE, say, 10 gallons of milk, which should not be sour, but should have developed sufficient sourness or lactic acid necessary to be present in milk intended for conversion into cheese. Milk drawn from the cow at the evening and kept overnight, when mixed with equal quantities of morning's milk (freshly mixed), and providing the evening's milk has not gone sour, generally meets the requirements. The evening's milk should be stirred and cooled after milking, and be kept in well-scalded vessels in a cool, clean atmosphere. This milk should be put into a clean tinned vessel about 2 feet long by 1 foot wide by 1 foot deep, which should stand in another vessel 2 feet 6 inches by 1 foot 6 inches by 1 foot 3 inches deep, and should rest on three pieces of wood laid on the bottom of the larger vessel, which will bring the top edge of inside vessel a little higher than the outside one. Hot water is then poured in the outside vessel, and the milk in the inside vessel should be stirred with a wooden pat till it reaches a temperature of 86 degrees Fahr. Should the water used at this period be of sufficient warmth to further heat the milk it should be drawn off by a water cock inserted in the bottom of the outside vessel; this water can be put back into the heating boiler if desired. When the milk is 86 degrees Fahr. add about fifteen drops of cheese colour and stir thoroughly; then add about ½ oz. of rennet, and stir for two minutes; then cover with a cloth (a piece of calico answers), and let the milk rest until coagulated and of such firmness that, when you insert the finger into it and raise the finger to the surface bent forward, the junket will make a clean break in front of the finger. This stage usually takes from twenty-five to fifty minutes from the time of adding the rennet, according to the sourness of the milk and the strength of the rennet.

Careful Attention Necessary.

This stage of the process requires careful attention. When the junket reaches the condition above described it should be cut into cubes about ½ inch square. For this purpose a vertical and a horizontal curd knife are used. The curd is first cut lengthwise with the horizontal knife, then crosswise and lengthwise with the vertical knife. The curd is then stirred for a minute with the hands or a pat; then more hot water is run into the outside jacket, and the curds and whey brought up to a temperature of 100 degrees Fahr. This should take twenty to thirty minutes. By this time the curd should become firm to the touch. A small piece of the curd (about the size of a walnut) should be taken and squeezed dry in the hand, and placed on an iron which has been heated to almost redhot. The curd should be firmly placed on the iron on a part that is just hot enough to hold the curd but not burn it; then draw the curd gently away from the iron. If sufficient acid is developed it will be noticed that small threads about ¼ inch long adhere to the iron. If the curd has not developed an adequate amount of acidity these threads will break away, or, if very sweet, the curd will not show any threads at all. In the latter cases the curd must be kept at the above temperature or not allowed to fall below 98 degrees Fahr. until it shows thickly populated threads ¼ inch to ½ inch long on the hot iron. When this is accomplished the whey should be drawn from the curd. This can be done by shifting the curd to one end of the vessel and dipping the whey out at the other. The end of the vessel should then be raised to allow the whey to drain away from the curd.

Draining Off the Whey.

After the whey is drawn off the curd will readily become mattered. It should then be cut into blocks about the size of bricks and turned over; the turning should be repeated about every fifteen minutes to allow the whey to drain off. In the course of about forty minutes the hot iron test is again brought into requisition, and a piece of curd applied as before, and when the curd shows fine threads about 1 inch long the correct acidity for cheese purposes has been attained. This usually takes from about an hour to an hour and a-half after drawing off the whey. The curd is next cut into pieces about the size of broad beans. There is a mill for this purpose, but a small quantity of curd can be cut with an ordinary butcher's knife. This completed, the curd is stirred with the hands just sufficient to separate any pieces that may have united. Stir and keep from matting for about thirty minutes. Then add 4 oz. of fine salt (or at that rate) and mix thoroughly.

Hooping and Pressing.

In seven to ten minutes the curd is now ready for hooping and pressing into cheese. For this amount of curd two 5-lb. 7-inch cheese hoops and one half-dozen yards of 7-inch binder are required. The half-dozen yards of binder are sufficient for 100 cheese of the weight above mentioned. After the curd is put into the hoops it should be pressed for twenty or twenty-four hours under a ton pressure. If the milk is too sweet at the outset it takes a long time to get the required acid (hot iron test), or if too sour the acid is developed too rapidly, and the cheese will be sour and probably leak on the shelves. Try to strike the medium. A nice time for completion of the process is about four to five hours from the time the rennet is added to the milk until the curd is in the hoops, preparatory to the application of pressure. In connection with the manufacturing of cheese from separated milk for home use, it will be found to be of advantage to the product if about one-third of whole milk be added to the separated milk.

THE CARE OF THE CAR.

WET WEATHER DRIVING ON BAD ROADS.

As autumn approaches a period of good rainfalls may be expected, and to the motorist that lives in the country wet weather usually means motoring under difficult conditions. Provided that roads are good, wet weather merely decreases the pleasure of driving, but when roads are unmade the question of "getting through" without being bogged is often a very vital one, particularly to those in the flat country. The novice when travelling along a water-logged road usually makes the mistake of trying to dodge the water-filled wheel tracks and favours the more dry-looking earth at the side of the road. This is usually a fatal mistake, as the wheel tracks generally have a hard bottom, whereas the virgin ground is usually very soft. The very fact that the water is held in the wheel tracks is evidence that the bottom is packed so hard that the water cannot soak away. There is, of course, no danger of becoming bogged on metal, asphalt, or concrete roads, but on certain classes of asphalt there is grave danger of skidding. Asphalt on which the metal shows through is usually safe, but that which presents a smooth oily surface must be treated with care, as often the surface is as slippery as ice.

Correcting a Skid.

A car usually skids on the back wheels only, and a skid of this kind can usually be corrected if the right action be taken. The skid usually occurs when the car is being driven or being braked. If the skid occurs while the accelerator is depressed release the accelerator immediately, and at the same time steer in the direction of the skid. Similarly, if the skid occurs while the brake is being applied, release the brake and steer into the direction in which the car is skidding. By steering into the skid as it is called is meant steering the front of the car to go the same way as the back of the car is skidding. Sometimes the driver is inclined to doubt the wisdom of releasing the brakes when he wants to stop because of something in front; however, releasing the brakes momentarily will help appreciably to stop the skidding, as the wheels turn and get a new grip. Where the road is at all dangerous and there is any likelihood of a skid, the driver should proceed slowly in low gear. Mountain roads where the track is of red volcanic soil should be treated with great respect. However, many roads on the plains are such that skidding is not at all dangerous, as there is nothing to hit, yet at the same time patches of the road are so greasy that the car seems to go sideways as readily as forwards. On roads of this type the car should be kept moving, and every time the car begins to skid the clutch should be disengaged. A free coasting car will not skid on the most slippery surface unless an attempt be made to turn. Very often remarkably bad patches can be travelled over by coasting.

"Getting Set" and "Getting Out."

When the car stops in a soft patch and the wheels begin to spin, it is said to be "set" or bogged. Once the car is "set" to keep the wheels revolving only means digging in deeper. The first effort to get out should be made by backing, as it is possible that the car will go out over its own tracks. However, if this fails, it is time to get out and inspect. A rope wound around the wheels will help considerably towards giving the wheels grip, and, of course, pieces of wood or stones packed under the wheels will help. When chains are available they should be fitted, but as very few motorists carry chains they are not generally available when required.

When a piece of rope is wound around the tyre care should be taken to see that it does not foul the brake gear when the wheels rotate.

When the driver has company the following is an ingenious method of getting the car out of a bog. Remove all the spark plugs so that the engine will have no compression, put the car in low gear, and then use the crank handle to rotate the engine. Most cars have a low gear ratio of between fifteen and twenty to one, so that the car can be wound out of a hole in this manner. The virtue of using man power rather than engine power lies in the fact that it is perfectly controllable, and the wheels will be rotated so slowly that the assistant may place sticks or stones under the wheels as they are rotated. Sometimes it will be found that one wheel only will rotate, and that this wheel has no grip. If it is desired to make the other rotate, the rotating wheel may be spragged so that the differential will transfer the drive to the desired wheel. This procedure is perfetly safe when the engine is being wound by hand, but is liable to cause a breakage if the engine be driven by its own power.

Getting Out of Deep Water.

Sometimes it is necessary to ford a stream a foot or more in depth. Many drivers believe in the rushing tactics, which is all right if the stream be narrow, but where water of any width must be crossed the wisest course is to tackle it at a walking pace in low gear. The radiator should be covered, or the fan belt removed, as otherwise the fan will blow the water splashed into the radiator all over the engine, and thereby cause trouble with the ignition system.

Where there is any possibility of the water coming up high enough to flow into the carburetter a piece of hose should be attached to the carburetter and tied so that it will draw air from above the water level. If water in any quantity is drawn in the carburetter intake it will partly fill the cylinders with water. Water, of course, is incompressible, and when the pistons try to compress it the piston or cylinder will be broken. Once the water reaches the intake the damage will be done before the engine stops revolving, even if it were switched off the moment the water reached the carburetter.

A water-blocked exhaust pipe will also cause the engine to stall, so that when fording deep water the exhaust should be extended. However, the blocking of the exhaust pipe will not lead to any more serious damage than the stalling of the engine.

After passing through water the brakes should not be trusted until they have had a chance to dry, as sometimes good brakes are made useless by becoming waterlogged. Wet roads do not usually wet the brakes, as the brake drums throw the splashed water off by centrifugal force, but when the wheels are immersed up to the drums in water, and are only turning slowly, the water quickly finds its way between the brake drum and the brake shield.—''Radiator,'' in ''The Farmer and Settler.''

ROLLED BARLEY AS A FOOD FOR PIGS.

In the course of a recent visit to America and Canada, Mr. F. C. Sargeant, of Thorpes, Ltd., Stock Food Specialists, Sydney, gained information of value to Australian pig breeders in that he found rolled barley a line of feed which enjoys enormous sale for all classes of animals, including poultry. Californian experience indicates that rolled barley is a superior food, even more valuable than ordinary whole barley or barley meal. When preparing barley in this form it has to be steamed very heavily so that the live steam will permeate the grain to such an extent that when it passes into the rollers it will flake out into a thin flake instead of breaking up. This heats up the grain to such an extent that there is a partial cooking of the starch cells, and it is this that is generally held to be responsible for the animal liking the feed better and doing better on it.

Rolled barley has proved of particular value in the fattening of pigs, for not only is there a greater gain in proportion to the feed used than any other food that has been tested, but the resultant pork is whiter, better grained, and altogether a superior product to flesh produced on any other food. The University of California has been conducting tests over several years and find that rolled barley with skim milk fed at the rate of 1 lb. of rolled barley to 3 lb. of skim milk gives excellent results, the average of a number of tests showing that there is 100 lb. of gain to 282.48 lb. of rolled barley consumed. This would appear to be a very good food for use on dairy farms where plenty of skim milk is available. The value of a combination of such a food with maize and other protein foods is also emphasised.

Answers to Correspondents.

State Forests and Bee-Keeping.

The Secretary of the Provisional Forestry Board, Mr. C. J. Trist, advises, in reply to inquiries received from time to time from apiarists as to the possibility of securing leases of the State forests for bee-keeping purposes, that it will no doubt be of interest to bee-keepers generally to know that the Forest Service will assist wherever possible by making leases available at a nominal rental.

Treatment of Blight in Cattle.

X. Y. Z. (Kilkivan) writes—

Several of my cows have a sort of a scum over one eye, which renders it temporarily blind. Is there any effective remedy for this?

The Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., advises that it is apparently what is commonly known as blight, and suggests a trial of this treatment:—A lotion composed of 20 grains of sulphate of zinc in 6 oz. of water should be obtained, and a few drops applied two or three times daily by means of a small glass syringe. It is necessary that early application be made, otherwise difficulty will be experienced in relieving the blight, which if neglected for any length of time will become incurable.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Bella Sombra Tree.

C P. (Jandowae)—

The specimen is the Phytolacca or Bella Sombra Tree, a native of South America, but largely planted as a quick-growing ornamental tree in most of the warm regions of the world. In Queensland and in South Africa it has received some praise as a valuable fodder for stock. Stock, particularly poddy calves and cows, seem to eat the leaves readily and they have a good nutritive value. The plant grows to a large size, and there are male and female trees. Propagation is readily effected by seeds. We do not know how cuttings would strike, but they are worth trying. The tree is cut down by frosts on the Downs, but otherwise it grows well and recovers on the approach of warm weather.

Brisbane Box Tree.

W.S.C. (Sherwood)—

The specimen is *Tristania conferta*, the Brisbane Box or Scrub Box, very common in the neighbourhood of Brisbane, and when planted making an ideal shade tree. It is largely planted in the Southern States as a shade and street tree, particularly in Sydney suburbs, where it is mostly grown under the name of *Lophostemon australe.* The practice there is when the trees attain a fair height to lop them off about six feet from the ground, causing them to produce a fine umbrageous head. We do not think seeds are stocked by Brisbane nurserymen, but most of the Southern nurserymen list plants in their catalogues, either under the name of *Tristania* or *Lophostemon.* The plant, however, seeds very heavily, and the envelope you sent was full of seeds that had dropped out of the seed capsules. If you wish to raise plants gather some of these seed capsules, lay them out on a sheet of paper for several days, and they will shed the seed. This can then be sown in flats or a garden bed, the young seedlings when a few inches high pricked off into pots and tins, and then planted out when large enough in their permanent positions.

Marram Grass.

W.A.McD. (Mackay)—

Marram Grass—The botanical name is *Ammophila arenaria* Link (Syn. Psamma arenaria, Roem. et Sch.), a grass widely spread, either native or planted, over the Atlantic Coast of North America and the sandy sea coasts of Europe and Northern Africa. It is a very valuable sand-binding grass and has been largely planted in the Southern States. It has been tried to a limited extent in Queensland, but on the whole the Queensland climate is too hot for it.

Ragweed. Wild Sage.

W.R.B. (Mount Larcom)—The specimens are:—

1. *Erigeron linifolius*.—Commonly known in Queensland as Ragweed. It is a tall growing, coarse weed that over-runs scrub farms at times but which is not known to possess any harmful properties.
2. *Salvia plebeia*.—A species of Wild Sage or Mint Weed. Most of the members of this family taint milk rather badly. The one you send is moderately common, but we have had no experience of the extent to which it would taint milk.

Hibiscus.

E.L.J. (Orkabie, N.C. Line)—

The specimen is *Hibiscus splendens*, a large Hibiscus very common in parts of coastal and sub-coastal Queensland. Along with others of the same genus it is comonly known as Native Rosella. The plant belongs to the family Malvaceæ or Mallow Family, very few of which are known to possess any harmful properties, and nothing is known to the detriment of the particular species you send. It is just possible that the hairy covering of the leaves may have a mechanical effect on stock, but the plant is certainly not known to possess any poisonous property.

Cotton Bush.

L.J.P. (Gayndah)—

The specimen is a species of Cotton Bush, either of Kochia or Enchylæna, but in the absence of seeds it is impossible to say which, as the leaves and stems are so very alike, the distinctions between the species being based on the seed. Cotton Bushes are closely allied to the Salt Bushes and are very common on Downs country in Queensland, less so in other places. They are very common along stock routes, being generally left to the last by stock. In spite of their harsh appearance, however, they have some value as a fodder, especially during times of drought, the plants being very drought-resistant. Under ordinary circumstances the plants are not particularly aggressive weeds and can be usually eradicated by cutting off below the ground level.

Turkey Bush. Wild Cherry. Wax Creeper. *Passiflora foetida.*

W.J.G. (Watsonville)—The specimens have been determined as follows:—

1. Turkey Bush, *Grewia latifolia*. The genus Grewia belongs to the family Tiliaceæ. There are several species in Queensland, and one or two, including the one you send, are popularly used throughout the North and the Northern Territory as a cure for dysentry and diarrhœa. This belief seems well founded, the curative properties of the plant being due to a mucilage it secrets when placed in water.
2. *Exocarpus latifolia*. A plant of the Santalaceæ or Sandalwood family, known locally as Doughboy by the children of your locality. It is often known as Wild Cherry in other places.
3. *Hoya australis*. Wax Creeper or Wax Flower. In times of drought this plant is sometimes eaten by cattle with fatal results as it causes severe gastro-enteritis.
4. *Passiflora fœtida*. This passion flower is a common species over the tropics, and in plantations is used as a cover crop to keep down weeds and is also ploughed in as a green manure.

Cape Cotton. Glycine Pea.

R. C. B. (Chinchilla). Your specimens are—

1. *Gomphocarpus fruticosus.* Cape Cotton. This plant is a native of South Africa, and is a great pest on some coastal farms. After the scrub has been cleared it comes up in a dense mass, somewhat in the same way as Inkweed and Wild Tobacco. The silk cotton contained in the seeds has no value as a true cotton, but has some slight value as a silk cotton or kapok. The plant has been accused of poisoning stock at different times, and belongs to a dangerous family, but stock rarely touch it or at least not to any extent.

2. *Glycine tabacina.* The Glycine Pea. A small legume common in the average native mixed pasture, and generally regarded as a useful fodder herb.

North Queensland Plants Identified.

J. J. W. (Alligator Creek, N.Q.).—The specimens have been determined as follows:—

1. *Sida rhombifolia*, commonly known in Queensland as *Sida retusa.* In New South Wales this plant is commonly known as Paddy's Lucerne, and is generally regarded as quite good fodder for stock. It is not known to possess any poisonous or harmful properties.

2. *Cassia occidentalis.* Wild Senna. Of the plants you send this is the most likely cause of your trouble. The green leaves of the Wild Sennas have been known to cause trouble in stock, a characteristic symptom being diarrhœa.

3. No flowers or seed heads on the specimen, but I should say a species of *Sida.* The same remarks apply to this as to No. 1.

4. *Sida acuta.* The same remarks apply here regarding properties as to Nos. 1 and 3.

5. No flowers or seed heads on the specimen, but I should say *Eurina lobuta*, commonly known in Queensland as Pink Burr or Chinese Burr, though this latter name is now applied to a number of plants. It is very common in several parts of Queensland, but possesses no harmful properties.

6. *Sida cordifolia.* The Flannel Weed, not known to possess any harmful properties.

7. *Acanthospermum hispidum.* Starr Burr, a native of Tropical America now naturalised in North Queensland, and a great pest in many places. It is not known to possess any poisonous or harmful properties.

8. *Euphorbia pilulifera.* Asthma Weed. This plant is regarded as very useful in giving relief to persons suffering from asthma. It is dried and used in the same way as ordinary tea, a wineglass full being taken as a dose.

9. *Malvastrum tricuspidatum.* A plant of the Mallow family very common in Queensland, but for which I have not heard a common name. It is not known to possess any poisonous or harmful properties.

10. *Scoporia dulscis.* A moderately common weed in Queensland with a very small flower and seed. It is not known to possess any harmful properties. I have not heard a common name for it.

11. *Amarantus spinosus.* Needle burr, not known to be poisonous or harmful in any way. The young shoots of most Amaranths are used in India and China as a spinach.

12. *Alternanthera denticulata.* A plant of the Amaranth family generally regarded as quite useful fodder and not known to possess any harmful properties.

13. No remark on the specimen, but seems simply like leaves of one of the Grass Trees, *Xanthorrhœa sp.* The Grass Trees have been suspected of poisoning stock, but feeding experiments carried out with them, both with the flowering poles and the leaves, have yielded negative results. On the better class Grass Tree country stockowners say that stock feed quite freely on Grass Tree without any ill effects following; in fact, they look upon the plant, particularly the young flowering poles, as having some considerable fodder value.

General Notes.

Pygmy Goose Protected.

An Order in Council has been issued under the Animals and Birds Acts totally protecting throughout Queensland the pygmy goose (Cheniscus coromandelianus). This bird is one of our rarer Anserine birds, and is rapidly dying out in Queensland, although some are occasionally seen in the Rockhampton district. Alternative names of the pygmy goose are the white-quilled pygmy goose and the goose-teal.

Citrus Crop on the Blackall Range.

The Minister for Agriculture and Stock (Mr. H. F. Walker) has received a report from the Instructor in Fruit Culture at Mapleton that the citrus crop for the Mapleton and Flaxton districts is a moderate one, but the fruit is well advanced, clean, and bright, and promises to be of good size and quality. In orchards receiving good cultural treatment trees are vigorous and healthy, with a satisfactory showing of wood for future crops. Owing to weather conditions a second blossoming is breaking in a number of orchards. The Instructor advises that the damage reported during the recent storms was not as great as estimated, and only in isolated cases was any material loss sustained.

Open Season for Ducks in Southern Queensland.

The present close season for ducks in Southern Queensland, which commenced on the 1st October, 1930, was due to end on the 30th April, 1931. In order to give sportsmen the chance to shoot ducks during the Easter holidays, however, an Order in Council has been issued ending the close season at midnight on the 31st March, 1931, instead of on the 30th April. This applies only to No. 1 district constituted for the purposes of the Animals and Birds Acts as described in an Order in Council of the 27th March, 1930, comprising, roughly, only that portion of Queensland south of Bundaberg.

Amendment of Slaughtering Act Regulations.

Regulation 32 under the Slaughtering Act has been amended. This Regulation, which has been in force since 1925, has provided that no person shall treat at, dress at, or bring into or upon any butcher shop, slaughter-house, or public abattoir the carcass or any portion of any stock which has died or been killed prior to arrival at such slaughter-house except for purposes of boiling down. This Regulation has now been amended so that from now on no person shall treat, &c., at any butcher shop, slaughter-house, or public abattoir the carcass or any portion of any stock which has died or been killed *elsewhere than at a slaughter-house or public abattoir* except for purposes of boiling down.

Staff Changes and Appointments.

Messrs. W. L. Childs, L. F. Childs, and F. Coombes have been appointed Honorary Rangers for the Nudgee Golf Links Sanctuary.

Mr. J. Carew, Senior Instructor in Sheep and Wool, and Mr. J. L. Hodge, Instructor in Sheep and Wool, have been appointed Inspectors under the Diseases in Stock Acts.

The Officer in Charge of Police at Nanango has been appointed an Inspector under the Brands Act.

Mr. F. J. Harris, Analyst in the Agricultural Chemical Laboratory, has been appointed an Analyst under the Fertilizers Acts.

Mr. H. Collard, Assistant Instructor in Fruit Culture, Department of Agriculture and Stock, at present attached to the Banana Experiment Station, Kin Kin, as Acting Manager, has been transferred to Rockhampton for general instruction in Fruit Culture in the Central District.

Mr. H. G. Crofts, Acting Secretary, Banana Industry Protection Board, has been appointed Secretary, Banana Industry Protection Board, as from the 31st July, 1930.

The appointments of Messrs. P. Mitchell, J. H. Mitchell, E. L. Miles, F. A. Drake, C. N. Morgan, W. G. Hancock, and J. M. Wills as Agents, Banana Industry Protection Act, have been confirmed as from the 31st July, 1930.

Fruit and Vegetables Act.

Till the present time the Fruit and Vegetables Act has applied only to potatoes, onions, green peas, green beans, and turnips as vegetables. The Governor in Council has now declared cabbages, carrots, cauliflowers, parsnips, and pumpkins to be vegetables for the purposes of the Act, and so in future the provisions of the Act will also apply to these vegetables.

Canary Seed Board Election.

The election of two growers' representatives on the Canary Seed Board resulted as follows:—

George Burton, Cambooya	68 votes.
Michael Coleman, Nobby	62 votes.
Garrett Denis O'Neill, Allora	60 votes.

Messrs. Burton and Coleman will therefore be reappointed for a further term of one year as from the 1st March.

Banana Experiment Stations—Rescission of Levy.

On the 31st July last an Order in Council was issued providing for a levy on banana-growers for the upkeep of the Banana Experiment Stations. This levy, which was at the rate of ½d. per case on cased bananas and 1d. in the £1 sterling on bunch bananas, has now been rescinded, and will not be deducted from proceeds of sales by agents after the 28th February, 1931. The levy for the Banana Industry Protection Board (at the rate 1½d. per case for cased bananas and 2d. in the £1 sterling on bunch bananas) will still remain and continue to be deducted by agents.

Sanctuaries for Animals and Birds at Nudgee and Cunningham's Gap.

An Order in Council under the Animals and Birds Acts has been issued declaring the following properties to be sanctuaries under the Acts:—

1. Nudgee Golf Links.—The property of Mr. W. L. Childs, Nudgee, known as the Nudgee Golf Links, comprising subdivisions 1, 2, and 3 of portions 293 and 294, parish of Toombul, county of Stanley; area, 70 acres.

2. Reserve for National Park, Cunningham's Gap.—The Reserve for National Park, Cunningham's Gap, parish of Gladfield, county of Merivale, as reserved and declared by Proclamation dated the 1st July, 1909, and published in the *Government* Gazette of the 3rd July, 1909, page 14; area, 3,100 acres.

Wessex Saddleback Pigs.

The first of this old-world breed of pig to arrive in Australia were imported by Mr. R. Turpin, of The Springs, Manly, Queensland, per s.s. "Matakana," which arrived on Monday, 9th March. Black in colour with a collar of white across the shoulders, this breed of pig originating in the British Isles has a reputation for producing first-class bacon of a type in demand in this country—i.e., with a maximum of flesh and a minimum of fat, withal a quick growing useful type of pig under English conditions. What their future will be in Australia remains to be seen; the first pair have been reported on favourably by those who have seen them. After undergoing the usual fourteen days quarantine at the Federal Quarantine Station, Colmslie, they will be transferred to the farm at Manly. Both pigs come from well-known prize winning strains, and from studs with a world wide reputation.

Control of Brumbies.

The Diseases in Stock Act Amendment Act passed last session of Parliament provided, among other things, for the destruction of brumbies (wild horses) on stock holdings in Queensland on certain conditions. The provisions, however, apply only to such portions of the State as are proclaimed by the Governor in Council, and are limited to a period of not more than four months in any year.

A Proclamation has now been passed declaring the Bowen, Maryborough, and Townsville Stock Districts to be districts in which the provisions relating to the destruction of brumbies shall apply, but they shall apply in these districts only for the four months from the 1st April, 1931, to the 31st July, 1931. Destruction of brumbies may therefore be carried out in these districts by stock-owners at any time during the said four months, provided that all formalities required by the Acts have first been observed.

Queensland Made Leather Goods.

Purchasing leather goods from the firm that actually makes leather goods is the safest method and surest way of obtaining best values. L. Uhl and Sons, Limited, recognised as "the Premier Saddle House," whose premises are in Queen street, Brisbane, are actual manufacturers of these goods, and their first-hand knowledge is available to all.

Here is a list of the main items procurable from this progressive saddle house: —Saddles for all manners of service—poley, stock, farm, station, military, polo, Bosca race saddle, Bosca exercise, boys' and youths' saddles, riding pads, cowboy saddles, Professor Bates's saddle, pack-saddles, &c. Harness includes American chaparejos, cowboy bridles, Mexican and plain spurs, bits, gags, collars and collar pads, buggy and sulky harness, plough harness, farm harness, hames, winkers, shaft harness, saddle cloths, bridles, chains, whips. Among other lines stocked are leather coats, leather caps, oilskin coats, leggings, men's boots, fishing tackle, belts, gloves, water bags, army combs, brushes, clipping machines, dog collars, straps and chains, camp requirements, ropes, saddlers' tools, brush pots and cases, saddle bags, water canteens, camp ovens, stocks and dies, leather portmanteaux, kit-bags, farmers' and blacksmiths' tools, Taubman paints and brushes, garden requirements, and carpenters' tools.

For all these lines Uhls claim that their prices are as low as it is possible to make them, and in every case only the highest grade articles are sold. Inquiries are welcomed, and an illustrated catalogue will be posted on application.

Commodity Boards Elections.

Nominations have been received at the Department of Agriculture and Stock in connection with the election of members for the following Boards:—

EGG BOARD.

District No. 1 (Caboolture-Bundaberg)—R. B. Corbett, Woombye (returned unopposed).

District No. 2 (Brisbane North-Redcliffe)—M. H. Campbell, Albany Creek; A. A. Cousner, The Gap, Ashgrove.

District No. 3 (Brisbane South-Cleveland)—T. Hallick, Mount Gravatt (returned unopposed).

District No. 4 (Moreton District)—Nomination incomplete.

District No. 5 (Darling Downs)—F. B. Common, Toowoomba (returned unopposed).

An election for District No. 2 only will therefore be necessary, and ballot-papers will probably be issued to owners of 50 or more fowls in that district early next month. The date fixed for the return of the ballot-papers to the Returning Officer is on or before the 30th April.

HONEY BOARD.

For this Board four growers' representatives are required and they will be elected from the following candidates:—

F. W. Bentick, Stanthorpe.
R. J. Bestmann, Caboolture.
A. R. Brown, Park Ridge.
C. W. Edwards, Greenbank, via Kingston.
H. E. Fagg, South Killarney.
John Schutt, Perthton, via Dalby.
O. N. Tanner, Samford.
G. H. Whiting, Coowoonga, Rockhampton.
R. V. Woodrow, Woodford.

The date fixed for this election is the 14th April.

BARLEY BOARD.

Two members are required for this Board and the only nominations received were from Messrs. H. Kessler, Cambooya, and Edward Fitzgerald, Felton East. The retiring members, Messrs. Burton and Coleman, did not seek re-election and the new members will be appointed at the expiration of their term of office—namely, the 23rd April, 1931.

Central Sugar Cane Prices Board Assignments.

In the "Government Gazette" of the 10th April, 1930, appeared Orders in Council assigning lands of canegrowers to certain sugar-mills in Queensland. As it has been found necessary to amend these assignments in certain particulars, an Order in Council has now been issued putting into effect such amendments. All persons whose assignments have been altered have been notified to that effect by the Central Sugar Cane Prices Board.

Bordeaux Mixture—Purity of Ingredients.

Though Bordeaux mixture is purchasable in commercial form, it is much more economical for the farmer or orchardist to prepare it for himself if it is to be used in any quantity. Full directions are given in a free departmental pamphlet on this subject, which contains the following note on the question of purity of the ingredients—copper sulphate (bluestone) and lime.

The bluestone available on the local market is of 98 per cent. purity, and this strength is usually prescribed in regulations under Pest Destruction Acts. Sulphate of iron may be present as an impurity in some samples—in most cases in minute quantity only; in others in appreciable quantity. Bluestone should be in the form of dark-blue crystals. It may be tested by dissolving a small quantity in water, and diluting this solution in a tumbler. A little ammonia should then be added and the mixture well stirred. A pale-blue precipitate is first formed, which dissolves to an intense blue colour. If iron be absent the solution will remain bright and clear. The formation of a reddish-coloured precipitate or sediment indicates the presence of iron.

It is of importance that the lime is freshly burnt. To test whether it is so, a few lumps should be placed in a heap and sprinkled with water, when it will gradually fall to pieces, becoming very hot in the process, giving off a quantity of steam, and crumbling to a fine, white powder. Some limes may not slake readily with cold water, but may do so with hot water. If it does not get hot enough to give off steam even with hot water, then the lime is unsuitable.

Diseases in Plants Acts—Amended Regulations.

The amendments to the Diseases in Plants Act that were passed last session of Parliament have made necessary some amendments to the Regulations under the Act.

The Regulations, in order to comply with the new definition of a nursery, have been amended to provide for a registration fee of ten shillings for any place where plants are offered or exposed or kept for sale. Definitions of "Diameter," "Fruit Tree," "Sale" or "Sell" and "Sub-package" have been inserted.

New Regulations have been made to provide for the sale of fruit trees and grade standards for same. These new Regulations provide that all fruit trees supplied by nurseries must be graded in conformity with certain standards, and must be of such variety as the tag or label indicates, and in the case of seedlings the tag must bear that word. Trees must be worked upon such stocks as they are purported to be or as defined by the purchaser. Stocks of trees must be of good quality, and in the case of apples and pears the roots must be of normal development, free from clustered or bunched small roots. All worked trees must be propagated by a single bud or graft, not double worked, and of one season's growth from same.

The following standards apply to size:—

(*a*) Apples and Pears.—Diameter not less than half an inch, except that in small-growing varieties of pears it may be seven-sixteenths of an inch.

(*b*) Apricots, nectarines, peaches, and plums.—Not less than half an inch in diameter.

(*c*) Citrus.—Diameter not less than half an inch, and trees of upright growth, well developed, and free from yellowing or chlorotic colouring of foliage.

Trees of standards (*a*) and (*b*), if branched, must be of fair shape with not less than three branches of not less than 18 inches in length.

The usual penalty of £5 for a first offence and not less than £5 nor more than £20 for a second or subsequent offence is provided for a breach of these new Regulations.

A Separator Stand Hint.

When setting the separator on a wooden block, first cover the whole top with a seamless piece of tin, cut to shape. This ensures greater cleanliness from drops of oil, milk, or cream. The wood, if unprotected, will absorb any fat, and besides looking dirty will harbour dust and germs. The tin can be kept as shiny as the machine.—"Spes" in the "Brisbane Courier."

Rumination.

When the cow begins to ruminate an automatic nervous control goes into effect. This is the rumination centre located in the brain, and it ensures co-ordination of all the factors involved in this complicated process. The lips of the œsophageal groove open, permitting the partial vacuum in the œsophagus to draw material back into this tube. At the same time there is increased pressure in the abdomen, and this helps to force food into the œsophagus. Whereas the normal function of the œsophagus is to contract its muscular walls in such a way that food is carried from the mouth to the stomach, under the stimulation of the rumination centre it does just the opposite, contracts at the bottom first, and a wave of contraction carries the material which is in the œsophagus back to the mouth. The water upon which this feed was washed into the œsophagus is immediately reswallowed, but the solid material is thoroughly ground and then reswallowed.

Honey Blending—An Aid to Profitable Marketing.

When it is realised that two samples of honey which separately would be hard to sell can by blending be turned into a first-class sample, the practical value of the process will be evident.

The blending of honey should interest all apiarists, writes the Senior Apiary Instructor of the New South Wales Department of Agriculture, as upon it depends the retention of the local market. It is little use developing a trade with choice samples and later having to rely on lower grades to retain that trade. And that is what happens if blending is not resorted to, for it is rarely found in any part of the State that the honey produced consists entirely of choice samples. On the chief selling floors of the city the general adoption of the practice of blending has been too long delayed, and it is to be hoped that the operations of the Honey Marketing Board will demonstrate the value of the practice.

With a number of different grades available, the choice lots move off freely, and the difficulty then arises of disposing of the lower grades. Blending, on the other hand, would allow of the whole floor being cleared practically at the one time. Moreover, if some variation in flavour is desired from time to time to meet a new demand, this could be arranged.

As an illustration of the value of blending, it might be mentioned that it is possible to produce a first-grade product from two second-grade samples, one of which is strong in the points where the other is weakest. The two samples if sold as straight lines would be difficult to dispose of.

In preparation for blending, each lot of honey will need to be carefully sampled and its quality assessed as regards flavour, colour, density, and aroma. Whether it is desirable to blend for the local trade or for a wholesale house, the apiarist must keep each extraction of honey separate, for mixed samples make the work of blending very difficult, involving much additional time in sorting. Successful blending depends upon using sufficient of the higher-grade honey to tone down the darker or more highly flavoured samples.

The blending should be carried out on a small scale first, the quantities of each grade of honey used being carefully measured. This test blend is heated (not above 140 degrees Fahr.) and then thoroughly mixed, and if it is found to be satisfactory the percentages of the different grades used can be taken as a guide for the mixing of larger quantities. If the blend is darker than desired, then a larger quantity of the light grade must be used; if too strong in flavour, then it must be further toned down by a larger percentage of the mild honey, and so on. Candied honey will require to be heated in order to liquefy it and then poured into the blending tank whilst rather warm. Particular care should be exercised to see that the different lines of honey are poured into the blending tank in such order as will ensure the most thorough mixing of the various grades. Careful work in this direction will save much subsequent stirring.

If the honey is to be blended by the Honey Marketing Board, selected straight lines of honey can be sent direct to the board's floor, where expert supervision and up-to-date plant are available to blend to the quality desired.

Man's First Want.

The first want of man is food, and his first resource for it the ground. Whether herbs or fruits were resorted to must have depended on their relative abundance in the country where man found himself; but the latter would probably be preferred, till the use of fire was discovered in the preparation of the former. The first care and labour of man would thus be bestowed on fruit trees, and hence gardening may be said to be the art of earliest invention. But man is also a carnivorous animal, and this propensity of his nature would soon induce him to attempt domesticating such beasts of the earth as he found most useful in affording milk, clothing, or food, or in performing labour. Hence the origin of pasturage and the management of live stock. The invention of tillage would be coeval with the discovery of the use of the cereal grasses, and may be considered as the last grand step in the invention of husbandry, and the most important, as leading to the establishment of property in territorial surface. In the earlier stages of civilisation these branches of economy, in common with all the arts of life, would be practised by every family for itself.

Aberdeen-Angus Cattle.

After a century of hard work the outline of the Aberdeen-Angus cattle has obtained such high perfection as beef producers that they are hard to beat, writes Mr. A. J. Tanner in the "Country Life" of Sydney. They are bred with an object of producing the maximum amount of beef with the minimum amount of waste. The legs are short and straight, and bone of great quality. The body is deep rather than round, although at a glance along the back it gives the impression of being built rather rounder than it really is. The hook bones are low set, and in unison with this the ribs are not excessively wide and square on the top but gently rounded, deep, and long. The shoulders are not narrow but roomy and easily fitting. As a result of this the fattened animal has an extraordinary depth of flesh along the back and loins, and on account of their gentle rounding the depth of flesh is carried well down both the fore and back ribs. The low-set hook bones allow the rump to be full fleshed and the round of the thighs to be well developed and carried down to the hocks. Undoubtedly the Aberdeen-Angus is a wonderful producer of roasts, steaks, and rounds.

Overstocking—Its Risk.

It may be laid down as a rule to which there is practically no exception (states a New South Wales departmental bulletin) that the increase in the risk from disease occasioned by overstocking is out of all proportion to the increase in the number of stock added to those already on a given area. This increase in risk involves three types of disease—infectious, parasitic, and dietetic. The chances of infectious disease spreading, are, of course, obviously greater where animals come into more direct contact with one another, and the longer such contact is continued the greater the risk. Since in most cases of parasitic infestation the eggs or embryos of the parasites are passed out of the animal with the fæces, it is equally obvious that the more stock are crowded together the more they will tend to become reinfested with the parasites.

Dietetic diseases are in most instances only to be expected when overstocking is continued for a long period; such diseases are sometimes so delayed in their appearance, and the exhaustion of the soil is also so gradual, that it is difficult at first sight to connect the two, but the connection undoubtedly exists. This refers to overstocking of a whole holding. It is, of course, often economically sound and wise from a health point of view temporarily to overstock some portion of a holding, even to a very marked extent, and then to allow that portion a rest from stocking. Changes such as this practice leads to benefit both stock and pastures.

The danger from crowding many stock together on small areas is most marked in the case of young stock—particularly calves. Concerning the dangers peculiar to grazing on certain types of country, mention may be made of paddocks particularly subject to blackleg, of swampy and low-lying country likely to favour the development of parasites, and of small areas on which certain markedly noxious plants may be growing. In dangerous areas of the first type, spelling, or better still, cultivation, have been found beneficial; in the second, draining, cultivation, and fencing-off may be utilised; and for the third, either the cutting of the plant or the interference with its accessibility for stock. When the last-named measures are impracticable, much loss may at times be saved if when the stock first get on to the area they are watched carefully and instantly removed on the first sign of sickness. Instances, too, are not wanting where loss has followed the deliberate disregard of warnings issued by competent authorities.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE INFANT'S FOOD.

BEFORE an architect can plan a house he must know something of the properties of timber, bricks, stone, and concrete. Before a mother can plan a wholesome diet for her children she must know something about the properties of common foods. Let us commence with the most important.

Milk.

It is a curious fact that many mothers, when questioned as to their children's diet, will mention every sort of food that they take except the most important. Evidently in their minds milk is not a food, but a drink, to be given perhaps to infants, but to be replaced at an early age by a darker fluid, which they call tea. Even for infants they will often buy a more expensive dried milk in tins "because that is a food you know." For two year olds they think that milk is of little consequence. No wonder we see so many poorly nourished children. These mothers seldom take milk themselves except perhaps a teaspoonful in a cup of tea. Now children are very suggestible. They are profoundly influenced by what they see their mothers do, and by what they hear their mothers say, sometimes even when they are not supposed to be listening. Therefore we are always seeing children who "won't" or "can't" take milk. It is quite true sometimes that the poor child can't take milk, but it is not the child's fault.

Fresh cow's milk properly modified is the best substitute for mothers milk, though not so good; but this is not its only use. Milk and leafy vegetables are the only foods which make up for the deficiencies of the other constituents of our diet—bread, porridge, potatoes, root-vegetables, and meat—at any age. Certainly milk is four-fifths water, but in contact with digestive juices it forms quite a respectable solid, which we call junket. The body-forming food or proteid in human milk is sufficient to enable the infant to double his weight in six months. Much of this gain is fat, but it is not all fat; brain, muscle, bone, heart, and other organs are growing too. Milk contains a sugar, which is only slightly sweet, but is easily assimilated by the baby. More important for the growing child are the fats of milk, which we call butter. They are our main source of the vitamins A and D, and without a liberal supply of these no child can grow properly. Milk again is our main source of lime, which is necessary for the growth of bones and teeth. All children should take a pint of milk a day in one form or another; many would do better with more than a pint. Milk is the one food for which there is no real substitute. It is a sad fact that Queensland is full of children who are more or less milk starved.

Milk is not a complete food for the growing child, but without milk no diet is complete. We should, therefore, take the greatest care of our milk supply. In this respect Australia is a backward country. Milk should be clean; much of our milk is dirty. Milk should be chilled; warm milk soon goes bad. Milk should be boiled or pasteurised. Owing to our long summers we have formed the habit of boiling our milk all the year round. Consequently our children rarely suffer from tuberculosis of the bones and joints, which are more common in other peoples, who have the unclean habit of drinking raw milk. We do not grow many hunchbacks in Queensland. But boiling milk, though a safeguard against disease, will not transform stale dirty milk into clean fresh milk. Milk delivered in clean bottles is protected from road sweepings and other dirt, but putting dirty milk into bottles does not make it any cleaner. Pasteurised milk is not always good milk, but fortunately in Brisbane good pasteurised milk is now obtainable. This is not so

everywhere. But if you can get milk that is fairly clean, not old and stale, bring it to the boil, then keep it cool, it should be good for twelve hours. If kept on ice it should be good for twenty-four hours.

There is still more to be said about milk. For the present we will say to every Queensland mother—be very careful of your milk supply, and give your children plenty of it. This is the foundation of good health.

BREAD-MAKING.

MARGARET A. WYLIE, Inspectress and Organiser Domestic Science, Education Department, Western Australia.*

THE science of bread making involves some knowledge of both Chemistry and Physics. A complete study of this art, therefore, necessitates familiarity with some of the fundamental principles of these sciences. Though bread has been made for countless ages, and has been the staple food of man, its successful making has been really the result of knowledge gained empirically. Modern hygiene has, however, demanded a more definite basis to justify its continuance as the main part of human diet.

Flour.—Of all cereals, wheat yields the best flour for bread. This is due to the fact that it is the only grain which contains the constituent gluten in the proper proportion and of the desired quality essential for turning out light, spongy bread. Flour also contains a large proportion of starch. The following is a simple test of their presence:—A cupful of white flour in a muslin bag, if saturated with water and pressed, leaves a yellowish, tough, elastic substance in the bag, somewhat the size of a walnut. This is the gluten, the starch having been expelled. This experiment gives a rough estimate of the proportion of gluten to starch in a standard flour.

White flours are classified differently in different countries. There is the millers' classification, the classification for commercial convenience in buying and selling, but the housewives' classification is from a very different standpoint, and should be as follows:—

1. Strong or old flour.
2. New flour.
3. Fine flour.
4. Weak or feeble bodied flour.

The first is of a deep, creamy colour, the kind that tumbles in a fluffy light manner out of a bag. If examined with a microscope, its gluten cell walls will be found to be very strong, having power to hold the gases that are formed by the action of yeast. Old flour is dry, and will absorb a large proportion of water.

The second type is whiter than the above and on account of its inherent dampness absorbs less water. It may be noticed that some flours retain their shape when pressed, an invariable sign that the flour is new.

The third, fine flour, is soft and elastic, not spongy and puffy, and producing a smaller loaf to the same proportion of flour. Its gluten is usually plentiful, its flavour in general being fine and "nutty."

Weak or feeble bodied is deficient in gluten, and hence in the capacity to retain the gases produced by the action of the yeast, as well in the power of absorbing moisture.

Strong flours therefore are most suitable for bread, fine flours for Christmas cakes, short pastes and short bread.

Yeast.—The article on jam making showed that various moulds and bacteria were the cause of decomposition and putrefaction of foods, and how the spores of moulds float about in the air. It must be remembered, however, that as well as harmful organisms, the air around furnishes useful bacteria. Wine, vinegar, and cheese are the result of these bacteria, properly employed.

Yeast also enters this category. It is a minute plant of the "fungi" family, so small that one million would cover only one cubic inch. Warmth and moisture speed its growth, its food being the sugar formed from starch. It thrives best at 78 deg. F. Its chief power is that of changing starch to sugar, and then converting the sugar into alcohol and carbonic acid gas. Provided the right food and conditions are given it, yeast propagates rapidly, at the rate of one million per hour.

* In the "Journal of Agriculture," Western Australia.

The gas generated by the action of the yeast is all important in bread making, for it is that which causes the sponge to rise, striving as it does to escape from its imprisonment in the gluten cells. It is possible to classify yeasts thus:—

(*a*) Liquid yeast.
(*b*) Distillers' yeast.
(*c*) German or compressed yeast.
(*d*) Dried yeast.
(*e*) A semi-dried form called putty yeast.

Liquid yeast is cultivated from a mixture of potatoes, sugar, water and hops.

Distillers' or brewers' yeast is a natural type, skimmed from fermented rye.

German or compressed yeast is bought in cakes, chiefly in England or the Continent of Europe. Unfortunately this often spoils in transit through the tropics.

The dried variety is made from hops and potatoes, mixed with starch and pressed into cakes.

The last type is built up in layers of semi-dried yeast.

Hops.—Hops act as an antiseptic, i.e., they help to destroy the power of certain bacteria and prevent thus the propagation of wild yeast. Consequently it is advisable to use yeast made from hops, as the use of poor potatoes and impure materials produces wild yeasts which spoil bread. As well as this negative use, hops improve the flavour of the bread.

To ensure really successful bread the making of yeast should be attended with every care and cleanliness. An old bottle (used before) can be used, but the corks and fittings must be perfectly clean, as the entry of foreign germs tends to spoil the value of the true yeast and start different cultures.

Preparation of Yeast.

Hop Yeast.—1 large potato, 1 pint water, 1 tablespoon sugar, 1 tablespoon flour, 1 teaspoon hops.

Method.—1. Boil potato, add hops while still boiling. Boil twenty minutes.

2. Strain, cool slightly, add flour and sugar.

3. Bottle and cork tightly.

4. The yeast should work in a few hours in a bottle previously used for yeast, twenty-four hours in a new bottle.

5. A fig or a raisin added will make it work more quickly.

Acid Yeast.—A medium-sized potato, 1½ tablespoons sugar, ½ teaspoon citric or tartaric acid, 1 cup warm water, 2 teaspoons flour.

Method.—1. Boil a mashed potato, add other ingredients and sufficient water to keep mixture at cupful.

2. Bottle and cork tightly.

3. Keep in a warm place twelve hours in an old yeast bottle and twenty-four hours (at least) in a new bottle.

White Bread.

Small quantity.—1½ lb. flour, ¾ pint tepid water, 2 tablespoons home-made or 1 level tablespoon brewers' yeast, 2 teaspoons sugar, 1 teaspoon salt.

Method.—1. Sift and warm 1 lb. flour, make a well in the centre.

2. Beat yeast and sugar to a cream.

3. Pour yeast and tepid water into flour and stir to a moist dough. Beat well.

4. Cover and stand in a warm place till the dough doubles its size. (Brewers' yeast takes about one hour and home-made several hours.)

5. Turn to a floured board and knead in the extra ½ lb. flour and salt until the dough is of even texture.

6. Shape into loaves, put into greased and floured tins.

7. Allow to rise in a warm place about half an hour.

8. Cook in a hot oven until the loaf is well risen and brown, then place in a cooler part until the bread is cooked through—thirty to forty minutes in all.

9. When cooked the bread should give a hollow sound when tapped on the bottom.

Wheaten Meal Bread.

1½ lb. whole meal or half wholemeal and half plain flour, 1 tablespoon yeast, 1 teaspoon salt, ¾ pint tepid water, 1 teaspoon sugar.

Method.—Proceed as for white bread, but more moisture, a hotter oven, and longer cooking is required.

The actual baking of bread is perhaps the most important part. With the utmost care in choosing flour, making yeast, and carrying out the correct procedure for mixing, if the oven is not at the right temperature the bread may be spoilt. The scientific baking of bread is to fix the air cells as quickly as possible by means of the hot oven. A novice would do well to test the oven thus:—Place a tablespoon of flour on a saucer for five minutes in the oven. If the oven is—

(*a*) Hot—the flour becomes dark brown.

(*b*) Moderate—the flour becomes a golden brown.

(*c*) Cool—the flour becomes pale brown.

The yeast will go on working or growing in the flour if the oven is too cool, still splitting up the starch and more alcohol is formed, which cannot escape. The bread has then a "beery" taste. If, on the other hand, the oven is too hot and the loaf begins to brown in less than fifteen minutes, a crust is formed and the inside of the loaf remains damp and uncooked.

Abnormal Fermentations.—The normal fermentation in bread making is due to the energy of the yeast plant growing and multiplying in the dough, giving off CO_2 and producing changes which result in making bread palatable and digestible. Other fermentations, however, sometimes occur.

Sticky or sour bread is due to lactic acid bacteria. These are associated with low-grade flour. The germs of these bacteria often lie dormant until essentials, such as warmth and moisture, necessary to their growth, are provided, and they then develop. Injurious germs also appear with yeast. This is sometimes overcome by the use of hops, which assists true yeast to overpower poor yeast. Dirty utensils and troughs harbour injurious bacteria. All crevices and cracks are teeming with unseen life, which reproduce enormously when given favourable conditions.

Musty or mouldy bread is usually noticed only after bread has been cut. This is due to damp flour in which fungi or mould has developed. Bags, containers, &c., holding this flour should be thoroughly scalded and scoured before being used for a fresh supply.

The same procedure should be carried out if bread is what is termed "ropy," or when tiny red marks appear. These, too, are the effects of wild yeasts, which have found their way into the dough.

THE FARM GARDEN.

MATURITY TABLE.

Vegetables vary considerably in the time they occupy in maturing their crop. Climatic conditions, variety, time of the year at which they are planted, class of soil, aspect of the land, and even method of cultivation influence the time taken, but the following table shows approximately the periods that should elapse between sowing and harvesting:—

Name of Vegetable.	Time usually occupied in maturing.*	Name of Vegetable.	Time usually occupied in maturing.*
Artichoke (Jerusalem) ..	5 –6 months.	Melon (Rock)	4 –4½ months.
Beans (Broad)	4½–5 ,,	Melon (Water)	4½–5 ,,
Beans (French)	1¾–2 ,,	Onion	7 –9 ,,
Beet	2½–3 ,,	Parsnip	5 –6 ,,
Cabbage	3 –5 ,,	Peas	3 –4 ,,
Carrot	2½–3½ ,,	Potatoes	3 –4 ,,
Cauliflower	4 –6 ,,	Pumpkin	3 –4 ,,
Celery	5 –6 ,,	Radish	3 –4 weeks.
Cucumber	2– 3 ,,	Shallot	3 –4 months.
Endive	2 –2½ ,,	Silver Spinach Beet ..	1¾–2½ ,,
Leek	4 –5 ,,	Tomatoes	4 –5 ,,
Lettuce	2 –2½ ,,	Turnip (White) ..	2½–3 ,,
Marrow	1¾–2 ,,	Turnip (Swede) ..	4½–5 ,,

* Approximate only, and in the case of crops that bear over an extended period calculated up to the commencement of harvesting.

Farm Notes for May.

Field.—May is usually a busy month with the farmer—more particularly the wheatgrower with whom the final preparation of his land prior to sowing is the one important operation. Late maturing varieties should be in the ground by the middle of the month at the latest.

Clover land, intended primarily for feeding off, should be sown not later than the end of April.

The necessity of pickling all wheat intended for sowing purposes is again emphasised; and for general purposes, combined with economy in cost of material, the bluestone and lime solution holds its own. To those who desire an easier but somewhat more costly method of treatment, carbonate of copper at the rate of 1 oz. to the bushel and used in a dry form is suggested.

Potatoes, which in many districts are still somewhat backward, should have by this time received their final cultivation and hilling-up.

The sowing of prairie grass on scrub areas may be continued, but should be finished this month. This is an excellent winter grass, and does well in many parts of Southern Queensland.

Root crops, sowings of which were made during April, should now receive special attention in the matter of thinning out and keeping the soil surface well tilled to prevent undue evaporation of moisture.

Every effort should be made to secure sufficient supplies of fodder for stock during the winter, conserved either in the form of silage or hay.

Cotton crops are now fast approaching the final stages of harvesting. All consignments to the ginnery should be legibly branded with the owner's initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

Orchard Notes for May.

THE COASTAL DISTRICTS.

In these notes for the past two months the attention of citrus-growers has been called to the extreme importance of their taking every possible care in gathering, handling, packing, and marketing, as the heavy losses that frequently occur in Southern shipments can only be prevented by so treating the fruit that it is not bruised or otherwise injured. It has been pointed out that no citrus fruit in which the skin is perfect and free from injury of any kind can become speckled or blue-mouldy, as the fungus causing the trouble cannot obtain an entry into any fruit in which the skin is intact. Growers are, therefore, again warned of the risk they run by sending blemished fruit South, and are urged to exercise the greatest care in the handling of their fruit. No sounder advice has been given in these notes than that dealing with the gathering, handling, grading, packing, and marketing, not only of citrus, but of all other classes of fruit.

It is equally important to know how to dispose of fruit to the best advantage as it is to know how to grow it. To say the least, it is very bad business to go to the expense of planting and caring for an orchard until it becomes productive and then neglect to take the necessary care in the marketing of the resultant crop. Main crop lemons should be cut and cured now, instead of being allowed to remain on the tree to develop thick skins and coarseness. As soon as the fruit shows the first signs of colour or is large enough to cure down to about from $2\frac{1}{4}$ to $2\frac{1}{2}$ in. in diameter, it should be picked, care being taken to handle it very gently, as the secret of successfully curing and keeping this fruit is to see that the skin is not injured in the slightest, as even very slight injuries induce decay or specking. All citrus fruits must be sweated for at least seven days before being sent to the Southern States, as this permits of the majority of specky or fly-infested fruits being rejected. Citrus trees may be planted during this month, provided the land has been properly prepared and is in a fit state to receive them; if not, it is better to delay the planting till the land is right.

In planting, always see that the ground immediately below the base of the tree is well broken up, so that the main roots can penetrate deeply into the soil and not run on the surface. If this is done and the trees are planted so that the roots are given a downward tendency, and all roots tending to grow on or near the surface are removed, the tree will have a much better hold of the soil and, owing to the absence of purely surface roots, the land can be kept well and deeply cultivated, and be thus able to retain an adequate supply of moisture in dry periods. Do not forget to prune well back when planting, or to cut away all broken roots.

All orchards, pineapple and banana plantations should be kept clean and free from all weed growth, and the soil should be well worked so as to retain moisture.

Custard apples will be coming forward in quantity, and the greatest care should be taken to see that they are properly graded and packed for the Southern markets, only one layer of one sized fruit being packed in the special cases provided for this fruit—cases which permit of the packing of fruit ranging from 4 to 6 in. diameter in a single layer.

Slowly acting manures—such as meatworks manure—may be applied to orchards and vineyards during the month; and lime can be applied where necessary. Land intended for planting with pineapples or bananas during the coming spring can be got ready now, as, in the case of pineapples, it is a good plan to allow the land to lie fallow and sweeten for some time before planting; and, in the case of bananas, scrub fallen now gets a good chance of drying thoroughly before it is fired in spring, a good burn being thus secured.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Clean up all orchards and vineyards, destroy all weeds and rubbish likely to harbour fruit pests of any kind, and keep the surface of the soil well stirred, so as to give birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Further, it is a good plan to clean up the land before pruning takes place as, if delayed till the pruning has been finished, the land is apt to dry out in a droughty season.

Pruning can be started on such varieties as have shed their leaves towards the end of the month, as it is a good plan to get this work through as early in the season as possible, instead of putting it off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—*not vines*, as the later vines are pruned in the season the better in the Granite Belt district, as late-pruned vines stand a better chance to escape injury by late spring frosts.

All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out now and burnt, as they are only a menace and a harbour for pests.

Land intended for planting should be got ready as soon as possible, as, if ploughed up roughly and allowed to remain exposed to the winter frosts, it will become sweetened and the trees planted in it will come away much better than if set out in raw land. In any case the land must be properly prepared, for once the trees are planted it is a difficult matter to get the whole of the land as well worked as is possible prior to planting.

Slowly acting manure—such as ground island phosphates or basic phosphates—may be applied to orchards and vineyards. They are not easily washed out of the soil, and will become slowly available and thus ready for use of the trees or vines during their spring growth. Lime may also be applied where necessary.

This is a good time to attend to any drains—surface, cut-off, or underground. The two former should be cleaned out, and in the case of the latter all outlets should be examined to see that they are quite clear and that there is a good getaway for the drainage water. New drains may also be put in where required.

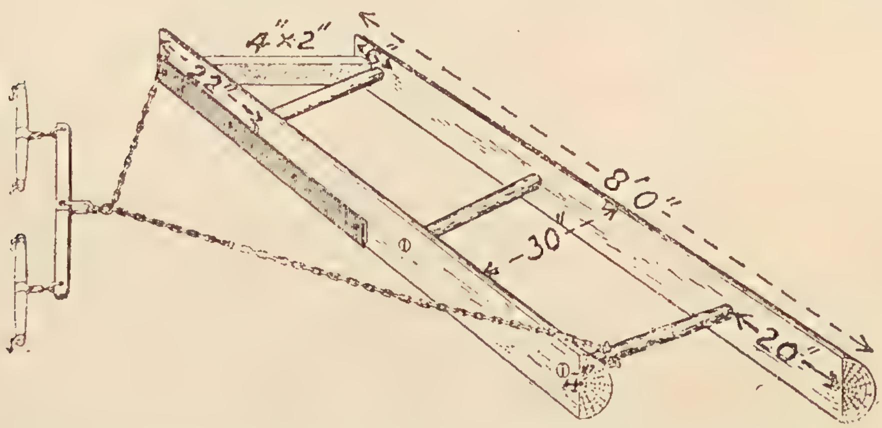
In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland; and growers will find that careful handling of the fruit will pay them well. Lemons grown inland are, as a rule, of superior quality to those grown on the coast, but are apt to become too large if left too long on the trees, so it is advisable to cut and cure them as soon as they are ready. If this is done and they are properly handled, they may be kept for months, and will be equal to any that are imported.

If the weather is very dry, citrus trees may require an irrigation, but, unless the trees are showing signs of distress, it is better to depend on the cultivation of the soil to retain the necessary moisture, as the application of water now is apt to cause the fruit to become soft and puffy, so that it will not keep or carry well.

Land intended for new orchards should be got ready at once, as it is advisable to plant fairly early in the season in order that the trees may become established before the weather again becomes hot and dry. If the ground is dry at the time of planting, set the trees in the usual manner and cover the roots with a little soil; then give them a good soaking; and, when the water has soaked into the soil, fill the hole with dry soil. This is much better than surface watering.

THE SPLIT-LOG DRAG.

The designer of this drag states that one great mistake sometimes made is in building the drag too heavy. It should be so light that one man can lift it easily, when it will respond readily to different methods of hitching, and to the changing of the position and weight of the operator. Another mistake is in using squared timber, instead of that with sharp edges so that the cutting effect of the latter is lost. The log should be 7 feet or 8 feet long (Fig. 1), and from 10 inches to 12 inches in diameter, and carefully split down the middle. The heaviest and best slab should be selected for the front. Four inches from one end and 22 inches from the other end of the front slab 2-inch auger holes are bored to receive two stakes, which hold the slabs 30 inches apart. The auger-holes are bored in the back slab at 6 inches from the gutter end and 20 inches from the road-centre end. A third stake is put midway between the other two. The stakes should taper both ways from the centre without any shoulder, and be tightly wedged in position. A 4 by 2 brace should be placed diagonally to the stakes at the gutter-end, lower edge at front



1 inch from the ground, the other end resting in the angle between the slab and end stake. A strip of iron about 3½ feet long, 3 inches or 4 inches wide, and ¼ inch thick, is often placed at the gutter-end for a blade. It should be fastened ½ inch below the lower edge of the slab at the outer end and flush with the edge of the slab at the other end. If the face of the slab is perpendicular, the blade should be given a set like a plane by means of wedges. A platform of 1 inch boards spaced 1 inch apart by cleats should be placed on the stakes. The chain should be fastened round the end of the stake at the road-centre end, so that the earth can drift past the face of the drag. The other end of the chain passes through a hole in the front slab, and is held by a pin through a link. The clevis should be fastened towards the blade end of the chain to force the drag to follow the team at an angle of 45 degrees to the line of draught. The driver rides in the line of draught, as a rule. The distance from the drag at which the team is hitched affects the depth of cutting. A short hitch lifts the drag, a long hitch causes the blade to cut more deeply. This is regulated by lengthening or shortening the end running through the hole in the slab. By shifting his weight, the driver can regulate the cutting, get rid of weeds, or deposit earth in a hollow. As a rule, two horses are sufficient on an ordinary earth road. It works best when the earth is moist but not sticky. When a road is badly rutted, it may be well to use the drag once while the ground is slushy.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	April, 1931.		May, 1931.		MOONRISE. April, 1931.	MOONRISE. May, 1931.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6.5	5.47	6.21	5.17	4.51	4.33
2	6 6	5.46	6.22	5.16	5.29	5.11
3	6.6	5.45	6 23	5.16	6.4	5.47
4	6 7	5.43	6 23	5.15	6.40	6.43
5	6 7	5.42	6.24	5.15	7.19	7.40
6	6.8	5.41	6.24	5.14	8.6	8.38
7	6 8	5.40	6 25	5.13	8.58	9.37
8	6 9	5.39	6.25	5.13	9 54	10.34
9	6 9	5.38	6.26	5.12	10.51	11.31
10	6 10	5.37	6.26	5.11	11.48	...
11	6.10	5 36	6.27	5.10	...	a.m. 12.27
12	6.11	5.35	6 28	5.9	a.m. 12.44	1.21
13	6.11	5.34	6 28	5.8	1.41	2.12
14	6.12	5 33	6 29	5.7	2.36	3.3
15	6.12	5.32	6.29	5.7	3.27	3.54
16	6.13	5.31	6 30	5.6	4.14	4.49
17	6 13	5.30	6 30	5.6	5.10	5.49
18	6.14	5.29	6 31	5.5	6.3	6.48
19	6.14	5.28	6 32	5.5	6.59	7.49
20	6.15	5.27	6 32	5.4	7.56	8.48
21	6.15	5.26	6.33	5.4	8.56	9.47
22	6.16	5.25	6.34	5.4	9.55	10.43
23	6.16	5.24	6.35	5.3	10.55	11.33
24	6.17	5.23	6.35	5.3	11.52	p.m. 12.14
25	6.17	5.22	6.36	5.2	p.m. 12.45	12.49
26	6.18	5.21	6 36	5.2	1.33	1.24
27	6.18	5.21	6.37	5.1	2.14	1.56
28	6.19	5.20	6.37	5.1	2.50	2.29
29	6.19	5.19	6.37	5.1	3.23	3.6
30	6.20	5.18	6.38	5.0	3.57	3.45
31	...	...	6.38	5.0	...	4.32

Phases of the Moon, Occultations, &c.

3 April	○ Full Moon	6 5 a.m.
10 ,,	☽ Last Quarter	6 15 a.m.
18 ,,	● New Moon	10 59 a.m.
25 ,,	☾ First Quarter	11 40 p.m.

Jupiter may be looked for between five and six degrees south of the Moon soon after midday on the 24th by those interested in a daylight observation. Both will be near the eastern horizon about 23 degrees north.

Mercury will set at 6.28 p.m. at Warwick on the 1st, and at 6.19 p.m. on the 15th.

Venus will rise at 3.3 a.m. on the 1st, and at 3.22 a.m. on the 15th.

Mars will rise at 2.22 p.m. and set at 12.40 a.m. on the 1st: on the 15th it will rise at 1.39 p.m. and set at 12.6 a.m.

Jupiter will rise at 12.59 p.m. and set at 11.17 p.m. on the 1st; on the 15th it will rise at 12.10 p.m. and set at 10.34 p.m.

Saturn will rise at 12.8 a.m. and set at 1.42 p.m. on the 1st; it will rise at 11.10 p.m. and set at 12.49 p.m. on the 15th.

The Southern Cross will be at position IX. about 6 p.m. on the 1st, and will be upright about midnight. At the end of the month these positions will be reached two hours earlier.

3 May.	○ Full Moon	3 14 p.m.
9 ,,	☽ Last Quarter	10 48 p.m.
18 ,,	● New Moon	1 27 a.m.
25 ,,	☾ First Quarter	5 38 a.m.

Apogee, 12th May, at 11.18 a.m.
Perigree, 28th May, at 2.18 a.m.

The Moon will occult Tau Sagittarii early in the morning of the 7th. In places as far north as Hughenden observers should be on the look-out before 4 a.m. with telescope or binoculars. At Brisbane, Toowoomba and Warwick, the Moon being almost directly overhead, observers using refracting telescopes without a diagonal eyepiece, will be at much disadvantage.

When Taurus, with its famous groups of Pleiades and Hyades, has sunk below the western horizon with the setting of the Sun on the 20th, the Moon will mark an adjoining constellation, Auriga, the charioteer, who holds a goat on his left arm, where the fine star Capella indicates its position near his left shoulder. The bright stars Castor and Pollux, the twins, will then be higher up eastwards.

Mercury, which was invisible in the early part of the month, having been in inferior conjunction with the Sun on April 30th (on the near side of its orbit), will reach its greatest altitude, 25 degrees, before sunrise on the 27th.

On the 31st the occultation of Sigma Scorpii, magnitude 3, will occur early in the evening. Between 3 and 4 hours later Antares, the principal star in Scorpio, will be occulted, if viewed from places north of Bundaberg and Tambo.

The Moon's apparent path amongst the stars in May will be: In Virgo on the 1st, through Libra on the 2nd and 3rd, through Scorpio to the 4th, Orphineus et Serpens to the 5th, Sagittarius from the 5th to the 8th, Capricornus to the 10th, Aquarius to the 12th, in Pisces to the 15th, in Aries to the 17th, in Taurus and Auriga to the 21st, in Cancer to the 23rd, in Leo to the 26th, in Virgo to the 30th, in Libra and Scorpio to the 31st.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/- including postage

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXV. | 1 MAY, 1931 | PART 5.

Event and Comment.

Anzac.

THAT the significance of Anzac Day is not dwindling with the passing of the years was evident in the Commonwealth-wide commemoration of the day and its deeds on the sixteenth anniversary on 25th April.

No chapter in the history of Australia—much less than the chapter that opened on the morning of the first Anzac Day—is without its importance in the history of the Pacific and of the world. The struggle that opened on 4th August, 1914, was a powerful agency in moulding the people of Australia and New Zealand. The causes of the war need not be dwelt on. To Australians it was in the nature of a crusade. The faith which upheld the nations fighting for human liberty was not more sound than among the people of Australia and New Zealand. All petty local differences were buried. Australia emerged a truly united nation.

Gallipoli cost us more than 10,000 men whom we could not afford to lose. Yet with their lives they purchased a tradition beyond human power to appraise and set for all time a standard for Australian youth. In the deeds done that day they not only showed the world what sort of man the Australian is, but also set the standard for every man who afterwards enlisted. The men who landed and died on Gallipoli made the Digger what he was. They died in the belief that they were fighting for a just cause—a cause in which was bound up the whole destiny of Australia. There is an urgent duty resting on every one of us, and that is to keep green the memory of the men of Anzac. Human memory is short. New interests and new problems are, with some at least, already crowding out even the recollection of the greatest deeds in our history. There is nothing we need more

than to keep alive in the coming years the patriotism—the genuine patriotism—that passed through our generation in the fateful years of war like fire glowing in molten steel.

As the years are passing there is gathering around the name of "Anzac" a great tradition, and it is for the newer generation that knows nothing about the tragedy of war to keep fresh the grace of remembrance. The patriotism of the dead will glow in the hearts of the living. We have sometimes left the great things—real patriotism, reverence, and gratitude—the big things of life, to chance. We cannot leave them to chance any longer, and the reverential commemoration by the whole nation on the Anzac anniversary may be accepted as overwhelming evidence of that determination. Let us discharge our debt to the dead by our charity for the living. Only by active service to the living can there be a true appreciation of those who died that we might live. We have war responsibilities to settle, but these are far outweighed by the peace opportunities that present themselves. What we want to foster is a broadminded, tolerant, co-operative spirit—the spirit of Anzac, the spirit that made the A.I.F. In the light of our brief history, in the light of our history since 1914, and remembering the men who made it, Australians will never lend a willing ear to the counsels of incompetence or despair.

All Australia's energy is needed now to build the Australia for which Australians fought, to build her into the nation she ought to be, the nation that her bravest sons hoped to secure by their sacrifice—their great sacrifice of radiant youth and life which they offered freely on the altar of human liberty.

Protection of Bird and Plant Life—Vandals of the Bushlands.

WHOLESALE slaughter in the suburban reaches of the Brisbane River of birds that have been given protection by the Government is to be countered with drastic action by the Department of Agriculture and Stock. Youths armed with pea-rifles have wrought havoc among native birds that have proved of immense help to the community. Magpies and butcher-birds by the dozen have been shot and the bodies tossed into gullies or the river, and these birds are great killers of insect pests. Especially in the Chelmer district and around Mount Crosby has the slaughter been going on, and the authorities intend to punish the offenders severely. It is likely that the campaign will be extended. Experience has proved that, particularly in the North, foreigners have no conception at all of the value of birds to the farming community. Kookaburras and ibises especially have suffered. It is declared that a kookaburra dare not laugh lest he go into the stewpot. The Department has appointed a small army of honorary rangers in various divisions of the State. They are provided with cards of authority, and are doing good work. Spoliation of bird life is not the only vandalism that is prevalent. During last year's session of Parliament there was one Bill which members of every shade of political opinion warmly supported. The measure was called the Native Plants Protection Bill, and it gave wide powers for the suppression of vandals of the bushlands. Its very title was an appeal to those who, without deliberate intent, thoughtlessly stripped the scrub and forest country of native shrubs and plants. The new legislation provided machinery for the declaration of sanctuaries; in fact, the Governor in Council was empowered to declare the whole State a sanctuary. It was thought, however, that those best able to suggest suitable areas would be the local authorities, and up and down the coast these were circularised and asked for suggestions. Only three have replied definitely favouring the scheme. They are the Pine Shire Council, Gayndah, and Mirani. The last-named is particularly anxious to preserve the beautiful

Eungella Plateau in its district from vandals. If the local authorities generally continue in their attitude of indifference it is possible that definite action will be taken from Brisbane to establish sanctuaries.

Preserving Native Bears.

HIS Excellency the Governor, Sir John Goodwin, speaking at the annual meeting of the National Parks Association in the course of the month, unhesitatingly pronounced the surprising wonders of the Hinchinbrook Channel to be among the most beautiful sights in the world. "As regards the flora and fauna," he said, "I think both of these are of the greatest importance. I had a letter only this morning from a well-known man in England. He is extremely interested in the fauna of Australia. He specially brought up the question of native bears which exist here and exist nowhere else in the world. They have tried several times to keep them in the zoological gardens in London, but have failed to keep them alive more than a few months. I think our only hope of preserving the fauna in Australia is by having big reserves in Queensland, where they will be adequately protected. There are many other animals, and also birds and flora, which I think it is of the utmost importance to preserve."

Kurrajong Seedlings.

IN our last issue it was announced that the Department had Kurrajong seedlings available in limited quantity for farmers and graziers desiring to plant and foster this very useful shade and fodder tree. So great was the demand that within a short time the supply of seedlings was exhausted. Each request was dealt with fairly in order of application, and the Department regrets its inability at present to comply with the many since received.

Tractor School at Gatton.

ONE phase of the activities of the Queensland Agricultural High School and College at Gatton covers periodical schools of instruction for farmers in order that they may have the benefit of an intense course of training in one or other of the several branches of husbandry. That the system is appreciated is obvious by the fact that every course has a full complement of students. The fees are nominal and are only imposed to cover essentials. Experts are in attendance, and the courses are intensely practical. The last course to be completed was the Eighth Tractor School which was in every way successful. Professor Murray, of the Queensland University, who is also Principal of the College, by the development of this fine idea has done and is doing yeoman service to primary industry in Queensland. The enrolment for the school just ended numbered seventy-two, mostly young men, which is evidence of the popularity of this form of college extension work. The farmers attending the school were intensely interested in their work. They came from all parts of the State, some from North Queensland, over a thousand miles away. Most of them, however, were from the broad wheatlands of large acreages where furrows stretch out to the far horizon. The aim of the College in inaugurating the tractor school was not to influence machinery sales. Some of the farmer students already operate tractors on their holdings; others had reached the stage where the advantages of the tractor had been forced upon their consideration, and they required complete information as to the economy of mechanical power before going to the expense of a large capital outlay. The College has made it its business to give these men the information and instruction they want, and it is doing its job thoroughly.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART XIV.

(c) Mills and Milling Work (continued).

PROCEEDING with the early sugar mills in a northernly direction up the coast after leaving Bundaberg, Isis, and Yandaran, we find there was a mill situated at Yeppoon. This mill, I understand, had the name of "Farnborough," and was in the 'nineties being operated by Mr. R. Armstrong. I believe the mill commenced crushing about 1884, and the cane required to make a ton of raw sugar of 88 net titre was 8½ tons. The price paid for cane to the farmers was 12s. per ton, at which price it was stated some farmers did very well. Mr. Armstrong ceased operations when (as he said in evidence before the Central Sugar Mills Commission of 1911) the Commonwealth Government took away his kanakas, as he considered he could not grow cane by white labour. Most of the mill machinery was subsequently sold. There was also a mill near Rockhampton at Alton Downs, known as the Pandora Mill. This was running in the early 'eighties for a while, but apparently the mill was unsuitable and lack of water compelled its closure eventually. As far as I can ascertain these were the only two mills between the districts of Bundaberg and Mackay.

What was known for many years as the "Sugaropolis" of Queensland—viz., Mackay—possessed a large number of mills in the earlier days, though not so many as Bundaberg. The Mackay mills, however, for the most part, were larger. The following is a list of the old Mackay mills as far as I know. I am indebted to Mr. Wm. Robertson, formerly an old millowner himself at Mackay, for the names of the owners:—

Mill.	Name of Owner.
Alexandra	Melbourne-Mackay Sugar Company
Ashburton	John Spiller
Barrie	D. Jack
Beaconsfield	A. Henderson
Branscombe	Martin and Long
Balmoral	W. Hyne and Company
Casada	Donaldson Bros.
Cedars	M. Hume Black
Coningsby	John S. Avery
Dumbleton	Lloyd and Walker
Farleigh	Sir John Lawes
Foulden	F. T. Amherst
Habana	Long and Robertson
Homebush	Colonial Sugar Refining Company
Inverness	Macdonald Bros.
Lorne	Robinson Bros.
Marian	George Smith and others
Meadowlands	Fitzgerald and others, afterwards W. Hyne
Miclere	Carrol and Avery
Mount Pleasant	W. S. Adams
Nebia	Gaussen and Fitzsimmons
Ninderoo	Paget Bros.
North Eton	Co-operative Company
Palms	John Ewen Davidson
Palmyra	H. McCready
*Peri	T. H. Fitzgerald
Pioneer	John Spiller

* This mill was erected but never crushed.

Mill.	Name of Owner.
Plane Creek	Co-operative Company
Pleystowe	Hewett and Romilly
Racecourse	Co-operative Company
Richmond	McBryde and Finlayson
River Estate	Long Bros.
Robbs Mill	Robb
Te Kowai	Davidson and Fitzgerald
Victoria (near Eton)	Melbourne Company

Cattle Creek Mill did not commence crushing till about 1906.

Of the above mills only seven are now crushing—namely, Farleigh, Racecourse, Pleystowe, Marian, Cattle Creek, North Eton, and Plane Creek. These seven mills, however, turn out far more sugar than was ever dreamt of when the larger number was crushing. The Pleystowe and Marian Mills were crushing as proprietary mills before they became Central mills.

In the early days Ninderoo manufactured a white sugar and took prizes in England for their whites and Demerara crystals.

From an illustration of some of the early sugar mills in Mackay the following particulars have been taken:—

Melbourne-Mackay Sugar Company Limited.

Palms Mill.—Total area 8,094 acres, situated on the Pioneer River, 7 miles from Port Mackay with railway running through; 5,000 acres cultivable; 3,042 at present under cultivation; total capacity working day and night 5,000 to 6,000 tons of sugar in the crop season; average output during the ten years prior to 1896—2,418 tons. Labour employed—White men, 81; coloured, 300; draught horses, 230.

Habana Plantation.—Proprietors—Messrs. Long and Robertson, commenced on single proprietary system 1882; in 1884 commenced letting to farmers; twenty-six farmers supplying in 1896. The area was 7,174 acres of freehold. Area under cane for 1896—1,300 acres. Mill capacity—4,000 tons of sugar per season. Seventeen miles of permanent tramway and 430 tram trucks. Population in 1881, 7 adults; in 1886, 630 adults.

Ninderoo Mill.—Distant 8 miles from Mackay; owned by Paget Brothers. Area, 2,050 acres. Area under cultivation on plantation, 1,050 acres. Number of white employees and kanakas, 220. Farmers numbering twenty and cultivating 900 acres supplied cane to mill from estate and adjoining properties; 2,000 acres scrub and forest land still available for farming within easy distance of mill. Capacity of mill, 4,000 tons of sugar. Double crushing and maceration; triple effet evaporating plant.

Farleigh Plantation (embracing Foulden, Pioneer and Ashburton Estate).—Owners, J. B. Lawes, Bart.; manager, F. W. Bolton; area, 9,000 acres. Capacity of mill, 7,000 tons of sugar. Treble crushing system with triple effets; vacuum pan capacity, 20 tons. Boiler power, 750 horse-power. Sugar house, 50 ft. by 150 ft. The number of farmers growing cane for the mill increasing. Average white labour employed, 70; coloured, 300. Present tramlines—15 miles, worked by locomotives; electric light and telephone used. Mission house for kanakas and church on plantation.

Pleystowe Central Mill Company, Limited, Mackay.—Started in 1894; first crushing in 1895—715 tons of sugar. Sixty farmers sending

PLATE 77.

Mr. Armstrong, the late Dame Nellie Melba's husband, was one of the first managers of the old Marian Sugar Mill, in the Mackay district. The house depicted above was built for Melba and her husband. It has since been shifted to another site and is occupied by the Chief Engineer (Mr. Guilfoil), and the house of the present manager (Mr. O'Neil) is erected on the original site of Melba's home. Mr. Dave Coyne, one of the oldest pioneers of Marian, remembers Melba in the early days of Marian.—(Taken from the "North Queensland Register.")

cane to mill in 1896. Mill capacity, 7,000 tons per season; area available, 15,000 acres. Two hundred and sixty trucks and 9 miles of tramway.

Mr. William Robertson, an old pioneer of the Mackay district, and who was a partner of the firm of Long and Robertson, has kindly supplied the following additional details:—"Two other small mills may be added to the Mackay list of the early 'seventies:—

"1. Owner, James Robb.—Small primitive mill, open-pan boiling. Molasses separated by drainage through perforated vats—possibly old West Indian process; I think it worked only one season. Situated at the Lagoons, on or near the site now occupied by the Mackay Experiment Station; nothing to do with Balmoral Mill near the main road on the other side of the same Lagoons.

"2. Owner, William Russell.—Small horse-power mill; turned out limited quantity of ration sugar; worked perhaps for two seasons. Would not pay; so the mill was closed. Situation (as nearly as I can remember) short distance to the eastward, not far from the junction of Nebo and Homebush roads.

"'Norbrook' I cannot place. I remember a man, John Emanuel Paine, who started to erect a small mill, but he sold before completing. Possibly he sold to Carroll and Avery; if so, it would become the 'Miclere' mill; that is in the list. Paine's place may have been called 'Norbrook,' but I cannot remember."

In connection with many of the early Mackay sugar mills, a valuation was made in 1890 by Mr. George Smith, a well-known Mackay resident at that time, which was furnished in connection with the movement that the Government should take the mills over at that period:—

	£
River Estate	100,000
Meadowlands	28,000
Foulden and Farleigh	150,000
Te Kowai	33,000
Pioneer and Ashburton	150,000
Alexandra	30,000
Dumbleton	10,000
Lorne	5,000
Carroll and Avery	10,000
Casada	5,000
Coningsby	16,000
Palmyra	15,000
Nebia	28,000
Barrie	17,000
Richmond	12,000
Homebush	350,000
Beaconsfield	12,000
Victoria	30,000
The Cedars	17,000
Marian	27,000
Inverness	12,000
Pleystowe	47,000
Habana	150,000
Racecourse	22,000
Ninderoo	80,000
Palms	50,000
Balmoral	6,000

Going on further North the next mill was the Central Sugar Mill erected at Proserpine about 1896, and which commenced crushing in the year 1897. This mill is still operating and was, and is, the only one in the Proserpine area.

The Lower Burdekin district at one time boasted of the following mills, viz.:—

Mill.	Name of Owner.
Airdmillan	A. C. Macmillan
Seaforth	James McKenzie
Drynie	Colin Munro
Kalamia	Charles and John Young
Pioneer	Drysdale Bros.

The Inkerman Mill was not erected till 1913 and the Invicta Mill at Giru was originally the Invicta Mill, near Avondale, in the Bundaberg district, from which place it was transferred in the year 1920, and had its first crushing in its new location in 1921. I understand that Drynie Mill was transferred to Bundaberg at a much earlier date, and became Mon Repos, afterwards Qunaba; so this exchange of mills was a kind of *quid pro quo* between the two districts.

Due I suppose to the difficulty of opening up the more Northern latitudes for sugar growing, the number of mills in the areas above Townsville were much less than in Bundaberg and Mackay. On the Herbert River there were five mills in the early days. Of these Gairloch Mill machinery was supposed to have been transferred from Captain Whish's Caboolture mill as early as 1871, and taken to the Herbert River in the steamer "Dawn." The Gairloch Mill was then owned by Mr. MacKenzie, who, I understand, afterwards sold same to Fanning and Nankwell. The following were the Herbert River mills:—

Mill.	Name of Owner.
Hamleigh	A. S. Cowley
Gairloch	Mackenzie, afterwards Fanning and Nankwell
Ripple Creek	Wood Bros. and Boyd
Macknade	Neames Bros., afterwards Fanning and Nankwell
Victoria	C.S.R. Company

The C.S.R. Company later took over the Macknade Mill; Hamleigh and Gairloch finished many years ago. Ripple Creek carried on till about 1910, I fancy, when it too closed down, the cane going to Macknade.

The Johnstone River district was first opened up for sugar-growing in 1880, and the jubilee of that event was celebrated in Innisfail in April of last year. The Johnstone River itself was discovered in 1873 by Sub-Inspector Johnstone, from whom the river was named. There was no settlement beyond occasional timber-getters till 1880.

Thomas Henry Fitzgerald who was one of the pioneers of the sugar industry in the Mackay district became interested in the Johnstone River area and first visited it in 1879, and he with others applied for eight selections of 1,280 acres each, and later started the Innisfail plantation. The first sod for the Innisfail Sugar Mill was turned on 5th August, 1881, and the crushing season was commenced on 9th November of that year and finished on 9th January, 1882. A report shows that 40 tons of sugar were manufactured.

In a booklet celebrating the cane jubilee of Innisfail full credit is given to the late Mr. Fitzgerald for his pioneering work. It is stated the influence of his enterprise can hardly be over-estimated.

At first there was an immense amount of prejudice against the Johnstone River locality. It was known that the place was at that period infested by fevers and pests. The position was isolated, and the land covered by the most difficult scrubs and swamps. Floods had to be feared,

and the heavy rainfall was always a great hindrance to progress; then came the proposal of Griffith to wipe out the black labour. As a result sugar-growing was expected to collapse, and a big proposition at the Tully was abandoned by Tyson.

The Innisfail Sugar Mill was erected on what was known as the Innisfail Estate, which was situate on the side of the river opposite to the town. Originally Mr. Fitzgerald also owned the land on the spot where the township now stands, but he exchanged it for land on the North Johnstone River in order to allow the town to be established. When the Innisfail mill closed down, Mr. Fitzgerald supplied cane to the Goondi mill. The Goondi Sugar Mill is stated to have commenced operations in 1883, and there was also a Queensland Sugar Company and sugar mill called "Innishowen," the old Queensland Estate, being on the Mourilyan side of the river. Dr. O'Doherty, Ryan, Fitzgerald, and G. W. Gray were interested in this mill, which commenced crushing about 1883. The machinery was stated to have been French. The date of the erection of the Mourilyan Sugar Mill is given as 1882, the first crushing taking place in 1884. The mill was first owned by the Mourilyan Sugar Company, in which Mr. Smellie was interested, and passed in to the hands of the Mourilyan Syndicate in 1907. In 1914 the property was taken over by the Australian Sugar Company, Limited, the present owners. The manager of the mill in 1882 was F. E. Nash.

The mills in the Innisfail district, therefore, were:—

Mill.	Owner of Mill.
Innisfail	T. H. Fitzgerald
Queensland Estate (Innishowen)	O'Doherty, Fitzgerald, Gray, and others
Goondi	C.S.R. Company
Mourilyan	Mourilyan Sugar Company

Considerably later the South Johnstone Central Mill was erected, and this mill, Mourilyan and Goondi, are the ones which are crushing to-day. The Tully Mill between Cardwell and Innisfail is also of recent date.

We now come to the mills erected at Cairns. The first mill at Cairns was stated to be the Pioneer at Hop Wah Plantation. The following account of the opening of this mill is given in the Jubilee Number of the "Cairns Post":—

"*Opening of Pioneer Mill.*

"At the official opening of the Pioneer Mill, a party consisting of Messrs. Clayton, Hill, Charles Adams (first manager of Goondi), R. T. Hartley, Captain Mylchreest, and his daughter, were present. The latter put the first cane through the rollers and Mrs. Andrew Leon christened the mill "Pioneer." Mr. Geddes was Engineer in Charge, and erected the mill for Walkers Limited; he continued at the mill, but after some time contracted a fever and died. The Hop Wah Mill was situate between the Four-mile Hotel and Cairns. The mill, which was managed by a Chinese named Leon, was owned by a company. Eventually the plantation was purchased by a man in Charters Towers, whereupon the mill was dismantled."

It was also stated in the same jubilee number that, at a meeting of shareholders in the Bellenden Ker Central Mill Company, the chairman announced that a site had been chosen for a mill. Those present were Messrs. W. H. Swallow (chairman), G. R. Mayers, W. J. Munro, and others. This mill apparently was never erected.

The next mill at Cairns was the Pyramid, and in the course of a description of the Pyramid Plantation, a writer in the "Queenslander" about 1884, said:—

"The Pyramid Plantation, owned by Messrs. J. B. Loridan and Company, is situated in a broad valley between two mountain ranges. Four hundred acres were under cane at the time of my visit, and more was being cleared. The dwelling-house of the manager and part proprietor is very pleasantly situated on a knoll midway between the ranges, and on the north can be seen the rolling waters of the Mulgrave, while on the south is the rippling water of a pretty babbling brook. Further up the hills, following the course of this brook, can be seen from certain points, a waterfall, and as this priceless boon insures a perennial supply, Mr. Loridan selected the land to include it. Mr. Loridan and his family have come from Sandhurst (Bendigo) in Victoria, fully equipped with mosquito nets and other essentials for comfort, but mosquitoes are unknown here, and the nets are packed away as lumber. Dwellers in Southern Queensland have little idea of what the climate northward is. The days are always hot, so much so that when work is attempted between the rows of standing cane, a profuse perspiration is forced from every pore.

"Description of Mill Plant.

"The Pyramid Estate contains over 5,000 acres of scrub land of volcanic origin, and was very rich in organic matter in all stages of decomposition. When the plantation was started, the intention was to extend operations, but since the supply of labour had been interfered with the proprietors have been compelled to limit their enterprise. They regret having gone so far as they have, for prospects are anything but assured, and but for the fact that a start had been made, and orders given in the Old Country for machinery, a complete stoppage would have taken place. The main portion of the crop of sugar-cane on this plantation consists of Rose Bamboo and Meera. Creole is grown here, but not in large quantities, and the general opinion is that the Creole and the Meera are identical. Cheribon and some other varieties, including several ribbons, are also under trial. The labour now on the plantation consists of 35 Europeans, 81 kanakas and 100 Chinese, and about 140 more kanakas are expected to arrive shortly. The kanakas are every where happy and contented, and appear to do their work as cheerfully as any other people. The Chinese are anything but reliable, and unless they are sharply overlooked, they will skulk and loaf frightfully and try in every way to take advantage of their employers. Much of the contract work in clearing off, burning off, and first planting is undertaken by these celestials, and only when thus dealt with can they be employed advantageously. Three hundred tons of machinery are already landed, and an equal quantity is to arrive. Manlove, Alliott, Fryer and Company, of Nottingham, are the makers of the machinery, which is equal to the manufacture of 10 tons of sugar every twelve hours. It consists of double crushing rollers, French double-bottom clarifier, filter press, triple effet, and vacuum pan, three multitubular boilers, 8 ft. in diameter, by 14 ft. long, with 136 tubes each, and separately up to 115 horse-power. A Godillot furnace is to be used to burn the megass as it comes green from the rollers—an appliance which has not yet been thoroughly tested in Northern Queensland. A sawmill is worked by steam, the engine being of 14 horse-power (by Robey) and which

works a vertical as well as several circular saws. The buildings erected for labourers are all that could be desired, being roomy, well ventilated, and evidently constructed with due consideration for the health, comfort and well being of those who occupy them. The European quarters are nearly a-quarter of a mile from the kanaka house, and form a comfortable block of buildings."

Later on a fire occurred at the Pyramid Mill which destroyed the buildings containing the boilers and the newly completed sugar mill, and also a storehouse attached to it. This, however, was rebuilt. Eventually the Pyramid Mill went the way of the small factory and ceased to crush.

The next mill to be erected was Hambledon, situate about 7 miles from Cairns. This was owned by Messrs. Swallow and Derham, of Melbourne, and was later on sold to the Colonial Sugar Refining Company who continue to operate same.

The last mill was the Mulgrave Central Mill. The company was formed in 1893 and registered in Brisbane on the twentieth day of April, 1895. The original company consisted of forty-four local farmers, who mortgaged their land to the Queensland Government under "*The Sugar Works Act of* 1893 *to* 1911," in order to secure advances for the building of the Mulgrave Central Mill and Tramways. The sum secured from the Government in this manner was £44,000.

The mill was built by Messrs. A. W. Smith and Co., of Glasgow, in 1896, and their contract price was £26,850, and the contractor's constructing engineer, Mr. Smart, ran the mill for the first season from October, 1896, to March, 1897, during which period 13,000 tons of cane passed through the rollers for a yield of 1,351 tons of sugar, equal to 10·1 tons of cane to a ton of sugar.

Proceeding to the Mossman (Port Douglas) district, I find there was a mill there in the old days known as Brie Brie. This stood on or near the farm now owned by Senator Crawford, and was the property of Mrs. Parker, somewhere about the year 1884. It was a 3-ton plant of an inexpensive kind combined with about 1,280 acres of land.

The present Mossman Central Mill was erected about the year 1896, and first crushed in 1897.

The most northerly mill in the early days was on the Bloomfield River. A large sum was expended on sugar machinery and cultivation, but without success. Subsequently the mill was sold to a Southern firm and transferred to Knockroe, near Childers. The original owner of the mill was named Bauer.

[TO BE CONTINUED].

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following notes from Mr. E. Jarvis, Meringa Entomological Laboratory, near Cairns:—

HINTS REGARDING CANE GRUB CONTROL.

At the present time (April) we may expect to witness decided evidence of cane-grub injury. Preliminary signs are now to be seen in slight wilting of the heart-leaves, which losing their bright green appearance become of a pale sage colour; while the edges of the leaf blades curl inwards, assuming a tubular form. This is especially noticeable during warm days, and is soon followed by yellowing of the leaves, which in cases of severe grub attack rapidly turn brown and die.

The grubs of the notorious "greyback beetle" (*Lepidoderma albohirtum* Waterh.) are now in the third instar or stage of growth, and in most places have attained their full size (about 2 inches in length).

Whenever opportunity occurs these grubs should be collected from plough furrows, and either destroyed or given to fowls. Do not forget that every second grub collected would—if left in the soil—produce female beetles, each of which is able to deposit an average of twenty-seven eggs. This means that the number of beetles arising from an acre of such land (infested, say, at the rate of five grubs per stool) would, if allowed to breed the following year, be sufficient to destroy about thirteen acres of cane.

Feathered Friends of the Farmer.

I would again impress upon growers the value of our insect-eating birds. Any species noticed following the plough should be encouraged as much as possible. The common "Straw-necked ibis" is admitted by all to be the grower's best friend, and the grubs eaten in a few hours by only one of these birds probably represents considerably more than the value of a labourer's daily wage. In addition to devouring the grubs of beetles they eat great quantities of grasshoppers and crickets.

Fighting the Grasshopper Plague.

The present season has been marked by noteworthy outbreaks in the Babinda, Ingham, Innisfail, and other districts of the familiar "Yellow-winged Grasshopper" (*Locusta danica* L.). This insect, which is one of the recognised plague locusts, occurs in many other countries, causing at times considerable damage to miscellaneous crops. Its last appearance in North Queensland in plague form was during the year 1912, when the Springsure and Mossman districts suffered a formidable invasion of this pest.

SUGAR CANE PRICES BOARDS.

Members have been appointed to five Local Sugar Cane Prices Boards as follows:—

Marian Local Board—

Millowners' Representatives—A. J. Coyne and J. O'Neill.
Canegrowers' Representatives—H. R. J. Barenthien and E. C. Walz.
Chairman—M. Gallagher.

Mourilyan Local Board—

Millowners' Representatives—L. J. Duffy and R. Sloan.
Canegrowers' Representatives—E. R. Campbell and G. F. Hudson.
Chairman—A. R. Aitkin.

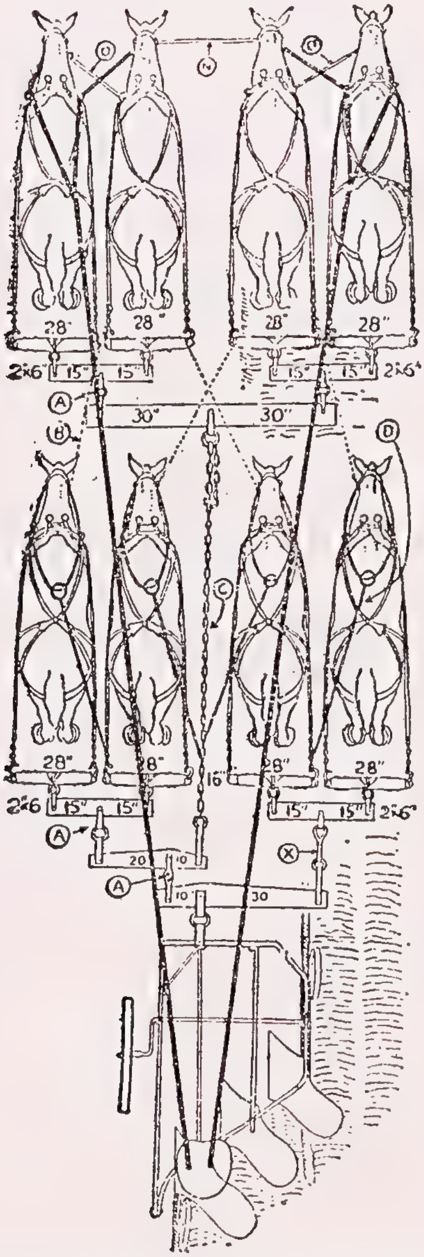
Plane Creek Local Board—

Millowners' Representatives—D. Greetham and A. Innes.
Canegrowers' Representatives—C. W. Davidson and P. McCowan.
Chairman—M. Gallagher.

Pleystowe Local Board—
Millowners' Representatives—R. Clarke and J. W. Inverarity.
Canegrowers' Representatives—M. W. R. Bowman and C. McKinley.
Chairman—M. Gallagher.

Racecourse Local Board—
Millowners' Representatives—J. M. Gibson and A. S. Hamilton.
Canegrowers' Representatives—A. Turner and T. J. H. Whitcomb.
Chairman—T. E. Dwyer.

MULTIPLE HITCHES.



The method that is used in America in hitching eight horses. Notice the simplicity of the method of handling. In making the double-trees the exact lengths given should be used so that the burden will be equally distributed.

THE KIDNEY WORM OF PIGS.

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

Introduction.

THE pig, more so perhaps than any other animal, affords asylum to a large number of parasites, a circumstance readily explained by the diversity and frequent impurity of its food and the insanitary conditions under which it is generally maintained. No less than seventeen species of internal parasites have been recorded from this animal in Australia, and of these, in Queensland at all events, the kidney worm is the one that appears to be most frequently encountered. In a reference to this parasite, T. H. Johnston notes its appearance in this State as early as 1871, when pigs at Ipswich were reported infested. Since then its occurrence has been recorded in many localities, and at the present time the species is known in Queensland wherever pigs are raised, though district infestations vary to an extent dependent on the climatic and hygienic conditions of the district concerned. In certain areas its infestations have already reached serious proportions, and unless it is brought under control in the immediate future the losses sustained by those interested in the pork and bacon industries will become increasingly severe.

As with most pests the part of the research worker is played when he has worked out the important points in the biology of the pest under consideration and formulated measures by means of which it may be controlled. The application of these measures—the most important part of all—remains in the hands of the person more directly concerned because of the losses he is sustaining, in this case the farmer, and it is surely to his own benefit that such measures should be properly and most carefully carried out.

The object of these notes is to place before the pig breeders of Queensland some facts dealing with the kidney worm, its importance and control. It is hoped that there will not be any difficulty in understanding such of the technical words and phrases as are included. A definite attempt has been made to replace such technicalities by simpler phrases, but it must be remembered that, in dealing with anatomy and diseases, technical words are part and parcel of the subject, and no other words can be used to imply what is required. The œsophagus, for example, is that part of the digestive tract leading from the pharynx to the stomach, and no simpler term understandable to all could replace it.

Description of the Kidney Worm.

The kidney worm, *Stephanurus dentatus* Diesing (Plate 78, figs. 3 to 4a), has a very distinctive appearance, and once recognised could not possibly be confused with any other internal parasite infesting the pig. It is a stout, elongate worm, measuring up to 2 inches in length with a maximum breadth of about one-twelfth of an inch. In colour it is somewhat pinkish and conspicuously mottled, due to the folds of the dark intestine and whitish reproductive organs which are visible through the more or less transparent coloured skin. At the anterior end is a rather large mouth which leads into a thick walled, cup-shaped cavity, the buccal capsule, at the bottom of which six conspicuous, triangular teeth are situated, whilst around its margin about fifty tiny tooth-like structures are to be seen (Plate 78, fig. 5). The large triangular and

the tiny marginal teeth enable the parasite to bore through and infest the tissues it invades. Of the two sexes the male is the smaller, and whilst in the female the posterior end is provided with a short tail (Plate 78, fig. 7), in the male it is furnished with a wing-like appendage known as the bursa (Plate 78, fig. 6). This bursa is typical of the roundworm group to which the kidney worm belongs, the Strongyles, and is simply a membranous outgrowth supported by a system of rays.

Organs and Tissues Infested.

The popular names, "kidney or lard worm," are derived from the more conspicuous infestations of the kidney fat, the perirenal and periuretal tissues. Here the infestation consists of nodular or cyst-like formations distributed throughout the tissues and distended with pus and bunches of worms. In very heavy infestations, such as are usually found among old pigs, the parasites may be also seen embedded in the spleen, liver, pleura and sometimes the lungs, in the muscles of the lumbar and costal regions, in the diaphragm, and in the mesenteric tissues. Sometimes the kidneys themselves are invaded, and it frequently happens that the parasites may be picked up lying free in the body cavities, an indication of their migratory tendencies. It would therefore seem that kidney worm infestation, when allowed to run its course, tends to become a generalised rather than a localised condition, and that migration through the body cavities appears to be connected with the life cycle, the parasites wandering through the various tissues in an endeavour to reach the fatty tissues of the kidneys, which are more conducive to their mature development.

Pathological Lesions in the Infested Organs.

(1) The Liver.

The pathological changes in the liver following kidney worm attack are far more pronounced than in any of the other organs and tissues liable to infestation. As a rule the liver becomes much enlarged, and varies in colour from a pale mottled to a dark purple, the former indicating a heavy and continued infestation (Plate 80, figs. A and B). In cases of light infestation the dark colouration is relieved by one or more whitish specks scattered over the surface and usually situated towards the edges of the lobes. When sectioned it will be seen that these specks extend some little distance into the organ and usually contain a small cavity or tunnel in which a worm, surrounded by a dark semi-solid substance, may lie. The whitish appearance is due to the great enlargement of the connective tissue enclosing the liver lobules and the subsequent shrinkage and degeneration of the liver cells. In such a liver bunches of worms and degenerated tissue will be found occasionally in the larger blood vessels and bile ducts, causing almost complete blockages in these systems and bringing about a congested condition from which the dark colour of the organ is derived. A further cause of congestion is to be found in the more minute vessels, the presence of the worms resulting in some way or other in a thickening of their walls, a reduction in size of their lumina, and eventually in a complete stoppage. In cases of more severe infestation the pale mottled appearance is due to wholesale degeneration of the active liver substance and its replacement by fibrous tissue. Large areas of the liver may consist solely of this fibrous tissue in which worms and worm tracts abound. Occasionally large nodular and abscess-like formations are encountered distended with worms and pus.

Such a diseased condition is known as chronic interstitial hepatitis or chronic cirrhosis, and is a direct result of invasion by the parasites. The disease may be attributed to the irritation caused to the tissues by the burrowing and feeding of the parasites, to the obstructions brought about directly and indirectly in the bile and blood vessels, and lastly to the toxins liberated by the worms themselves.

(2) The Kidneys.

Heavy invasion of the perirenal and periuretal tissues produces severe inflammation followed occasionally by complete or partial degeneration, the solid fat being replaced by a colourless, jelly-like fluid. The ureters become nodular, and their walls thickened to a tremendous degree. The pelvis of the kidney becomes distended with pus and other impurities, and, when the kidney substance itself is infested, fibrous tissue replaces the more active cells and abscess formation may occur. The kidneys tend to become enlarged, soft, and spongy (Plate 79, figs. A, B, and C).

(3) The Lungs.

Pathological changes in the lungs following kidney worm attack, although more or less confined, are rather marked. The parasites are usually to be found embedded in the pleura, but occasionally invasion of the lung tissue takes place, and is generally to be found only in cases of long duration, that is, in old pigs. In such instances the worms lie embedded in the lung immediately beneath the pleura. The surrounding lung tissue breaks down into a dark purulent mass, sometimes accompanied by definite abscess formation.

(4) Other Glands and Tissues.

Certain of the lymph glands are subject to infestation—namely, the renals, portals, and mesenterics, and are said to become enlarged, hardened, and uneven, and in the earlier stages to have a congested appearance. In infestations of long duration practically all the secreting

---

THE KIDNEY WORM OF PIGS (*Stephanurus dentatus* Diesing).

(*Description of Plate, page* 293.)

Fig. 1. Egg x 172.

Fig. 2. Mature larva x 106. Note the outer sheath completely enclosing the larva. This sheath is cast when the larva infects the pig.

Fig. 3. Female kidney worm x $2\frac{1}{4}$.

Fig. 3a. Female kidney worm, natural size.

Fig. 4. Male kidney worm x $2\frac{1}{4}$.

Fig. 4a. Male kidney worm, natural size.

Fig. 5. Head x 106.
- (*a*) buccal cavity;
- (*b*) large triangular teeth;
- (*c*) oesophagus;
- (*d*) tiny marginal teeth.

Fig. 6. Posterior extremity of male x 34. Note the bursa which is supported by a number of rays.

Fig. 7. Posterior extremity of female x 34.
- (*a*) genital opening;
- (*b*) anus;
- (*c*) lateral papilla.

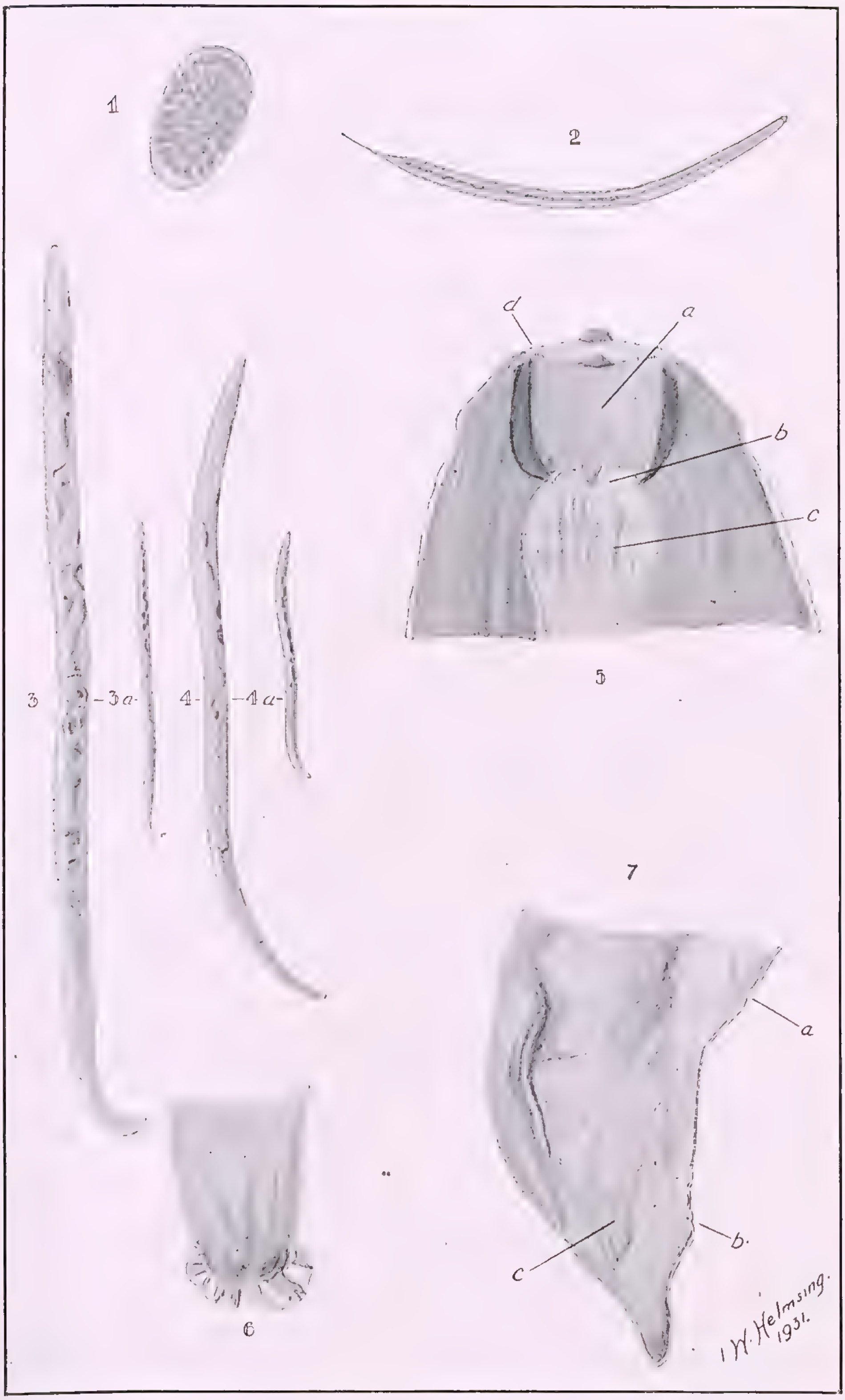


PLATE 78.—THE KIDNEY WORM OF PIGS (*Stephanurus dentatus* Diesing).
(*For description of Plate, see page 292.*)

tissue may become replaced, as in the liver, with fibrous tissue intermingled with worm tracts containing either worms or degenerated tissue.

Migration through the peritoneum and muscle tissues may bring about acute inflammation accompanied by pus formation.

Effect of Kidney Worm Disease on the Pig.

Generally speaking, the effect of a parasite upon its host is more or less dependent on five factors which may be enumerated as follows:—

1. The number of parasites present.
2. The part or parts of the host infested.
3. The nature of their food.
4. Their movements within the host.
5. The age of the host.

1. A single parasite usually causes so little inconvenience to its host that its presence is not suspected, whereas if numbers of a species are present serious disturbances in the health of the host may arise. This may be due to the appropriation of large amounts of nourishment by the numbers present, to the quantity of toxins produced by the parasites, and to the serious pathological changes in various organs and tissues resulting from heavy infestations. The kidney worm is no exception to the rule, and it is consequent on heavy invasions only that the parasite becomes conspicuous in its reactions towards the health of the host.

2. So far as the kidney worm is concerned this factor is intimately related with those under headings 3 and 4. A parasite may, for example, inhabit the digestive tract and do no appreciable harm, but if it should, in the course of its life cycle or as a result of any abnormal reaction, invade certain tissues, serious disorders may result. The kidney worm, if confined to the fatty tissues of the kidneys and ureters, may do a certain amount of harm, but its migrations through the body cavities involve the destruction of certain other tissues of the utmost importance to body health, thereby greatly increasing the disturbances to the health of the host. The kidney worm may therefore be placed among the more pathogenic parasites, for, instead of merely appropriating a proportion of the nourishment of the host, it feeds upon and destroys living tissues.

The diseased conditions exhibited by the infested liver, kidneys, and kidney fat, the several lymph glands and lungs, demonstrate what a severe and disastrous drain on the health and vitality of the pig kidney worm infestation may produce. Invasion of the liver results in the ultimate degeneration of the secreting cells and the formation of obstructions in the bile and blood systems. Such a condition means a much lessened secretion of bile, a secretion of the utmost importance in digestion, and, moreover, the little that is produced is prevented free deliverance to the digestive tract because of the obstructions in the vessels supplying it. Partial and complete blockages in the vessels of the blood system not only hinder the distribution of the pure arterial blood throughout the organ, but also delay the excretion of impurities.

The kidneys themselves, although infestation elsewhere in the pig may be fairly heavy, are rarely attacked; but, as they are the principal excreting glands in the body, any interference with their normal activities must lead to severe complications. The distended pelvis filled with pus and toxins, the thickened and nodular ureters, abscess formation,

and the replacement of the active excreting cells by useless fibrous tissue cannot but have a disastrous effect on the wellbeing of the infested animal.

Invasion of the renal, portal, and mesenteric lymph glands causes their ultimate degeneration, and, as their secretions are of vital importance to body growth and health, conditions resulting from their decreased activities are obviously harmful.

5. There are, as a rule, two stages in the life of the host when parasites appear to have more influence on its health—viz., during the periods of adolescence and old age. During the earlier stages of growth the organs and tissues are very tender and offer little resistance to the invading worms. In old age the susceptibility is increased as the reduced vitality of the animal gives not only a lessened ability to defend from attack, but also reduced activities and secretions of various glands, thus decreasing the capabilities of eliminating the parasites. Kidney worm disease, however, does not quite conform to the general rule, for, although it may play havoc among young pigs, it is more usual to find heavy infestations among old pigs. The disease appears to be cumulative, and for this reason is generally much more advanced in pigs which have been exposed to infestation for long periods, while in young pigs the infestations are, as a rule, light, as the periods of exposure are comparatively short.

Symptoms of Kidney Worm Disease.

Only heavy infestations are likely to give definite external symptoms. The inflammation of the renal tissues and abscess formation in the kidneys themselves produce an acute tenderness of the infested region, which may be detected by placing the hands on the loins and gently applying pressure. The invasion of the muscles adjacent to the kidney, aided, no doubt, by the accumulation of toxins, appears to affect the nerves traversing this region to the hind quarters, and a stiffness in the movements of the animal may be detected. Paralysis of the hind quarters is said to be the last stage in this interference. It should be mentioned that, although paralysis of the hind quarters may be associated with severe kidney worm infestation, the condition may be also a result of other causes. As the disease advances the animal spends most of its time lying down, rising to its feet only when urged, and death may follow this stage in a very short while. Emaciation may occur but is not always included among the symptoms of the disease, as animals which appeared in good condition have died as a result of infestation. Kidney worm disease is extremely difficult to detect in the early stages, and the presence of the worms may be detected only after an examination of the urine, with which the eggs of the parasites are carried out of the body.

Economic Losses.

The economic losses following kidney worm infestation may be regarded in two ways, firstly, as the loss sustained by the farmer through diseased herds, and, secondly, as the loss in the pork and bacon industries through rejection of infested parts of the carcass and sometimes the whole carcass.

To the farmer, besides the direct losses occurring through the deaths of infested animals, kidney worm infection means an unthrifty herd producing little profit. With feed, building equipment, and labour all high priced the margin of profit is by no means large, and what profit may eventuate must be adversely affected by the presence of these

parasites. The most profitable pig is, of course, the disease-free pig which reaches marketable weight in the minimum of time. The pig that harbours kidney worm is held back in its growth, and does not attain the desired weight till perhaps twelve months old. Furthermore, heavy infestations produce a lowering of the vitality of the host, and the pig becomes susceptible to many other diseases which, probably, would be successfully resisted by a worm-free animal.

In the pork and bacon trades infestation usually means the rejection of the affected parts. The livers and flares (the kidneys and adjacent fat) are the parts generally implicated, and perhaps at the present time, as no great value is placed on these parts, the economic losses resulting from their condemnation are not felt to any great degree by the industry concerned. The liver, however, may prove a valuable commercial asset, its extract now finding a ready sale for medicinal purposes from at least one factory. Under such circumstances, especially when it is pointed out that a recent investigation showed that of 62·8 per cent. livers that had been condemned, no less than 72·1 per cent. were discarded because of kidney worm infestation, the losses take on a more serious aspect.

The position as regards the export trade in pork is, at the present time, far more acute. The world's requirements in the way of pork are far in excess of the production, and great possibilities for the expansion of this industry exist, and no time has been more favourable for this expansion than the present. The United Kingdom is, to-day, most favourably impressed with the type and quality of the pork exported from Australia, and is willing to take as many first-quality carcasses as can be supplied. The export trade is experiencing difficulty in obtaining sufficient numbers of suitable disease-free pigs, and investigation has revealed that much the greater number of rejections is a result of kidney worm infestation.

The pig, mainly perhaps through the use of germ-infested milk, appears more prone to tuberculosis than any other animal, and for public safeguard most careful inspection is made of all carcasses. Carcasses are examined in Australia before export, and the ticket of health is checked in the United Kingdom before entry is permitted. For this purpose certain glands are exposed and incised, and must be present in the carcass for check inspection. The infestation of the renal fat by the kidney worm usually involves the removal of the renal glands, and a carcass in which these glands are not available for inspection is refused import. Infestation of the muscles along the

---

THE KIDNEY WORM OF PIGS (*Stephanurus dentatus* Diesing).

(*Description of Plate, page* 297.)

Fig. A. A normal healthy kidney. Note the evenness and uniformity of its surface.

Fig. B. A kidney lightly infested with kidney worm. The pelvis of this kidney was distended with pus in which three worms were found. Several worm tracts were also noticed in the kidney substance. Note the small, dark, sunken areas which are scars of healed injuries.

Fig. C. This kidney was obtained from a very heavily infested backfatter.

(*a*) These whitish sunken areas are the result of excessive growth of the connective tissue.

(*b*) Scars of healed injuries.

(*c*) A large retention cyst. This cyst extended fully an inch into the kidney and was filled with watery pus.

(*d*) This portion of the kidney has been sectioned to show numerous worm tracts.

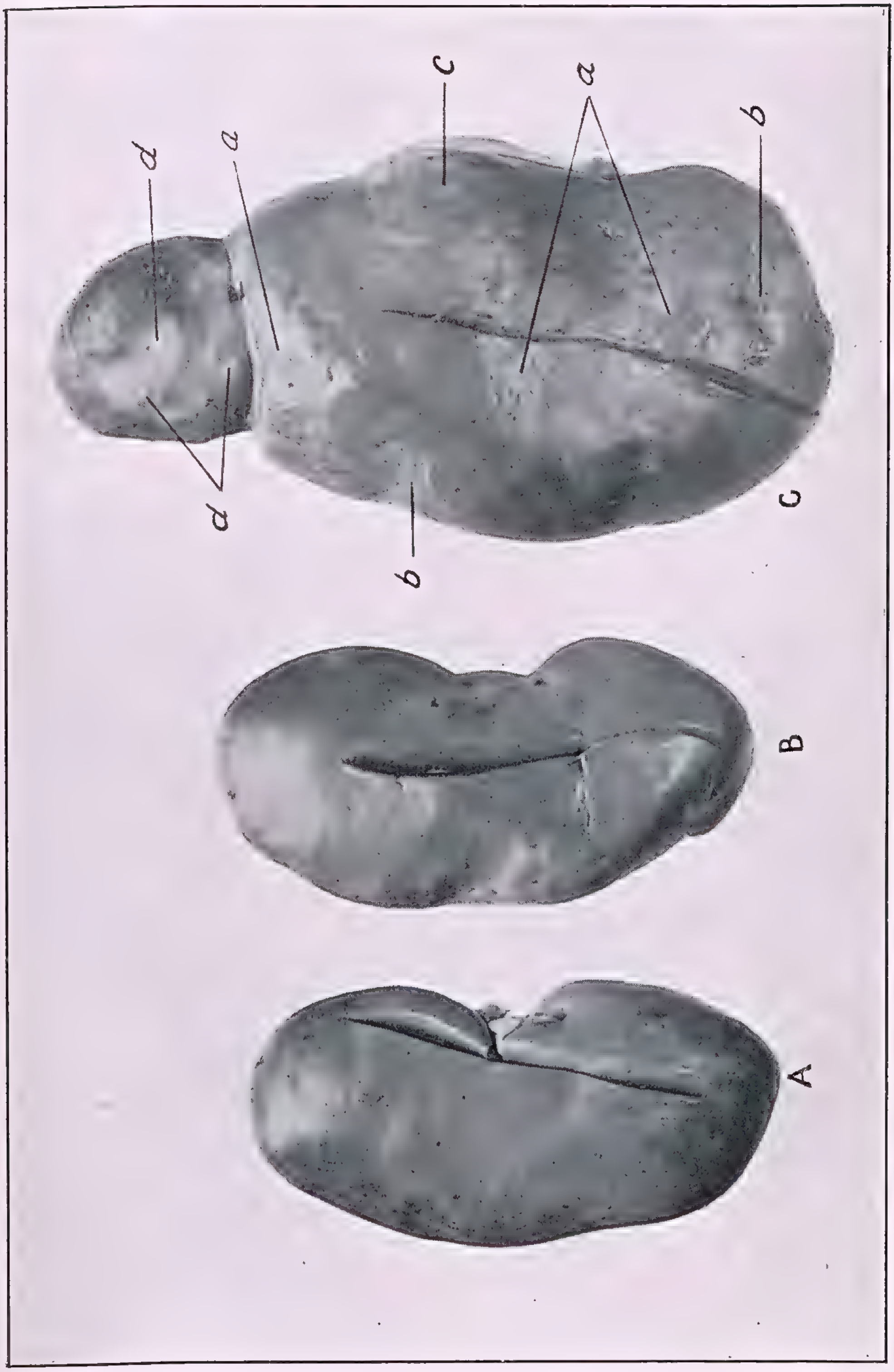


PLATE 79.—THE KIDNEY WORM OF PIGS (*Stephanurus dentatus* Diesing).
(*For description of Plate, see page* 296.)

back and on the ribs is a further cause of rejection, as the removal of these worms results in a mutilated carcass. Such carcasses may be accepted in the East, but, as the future of the export trade lies to the greater extent with the United Kingdom, such large interferences cannot but have a most serious effect on the trade. The difficult position in which the export trade finds itself is revealed by the following figures of infestation. Returns of 51,774 pigs slaughtered throughout the State between November, 1930, and February, 1931, showed that no less than 29·5 per cent. were infested, whilst from those districts supplying the Southern export trade the percentage infested was 32.5.

The figures given above and the accompanying remarks serve to indicate the position in the pig industry that the kidney worm has assumed and emphasise that if the industry is to prosper, as it should with the present excellent prospects, drastic measures will have to be taken by all concerned to bring this parasite under control.

Distribution of the Kidney Worm.

The kidney worm appears more prevalent in tropical and sub-tropical countries than elsewhere. It is known in the United States, more especially in the Southern portions, the West Indies, Central and South America, South Africa (rare), Asia, the Philippine Islands, and Australia. In Australia, both Queensland and New South Wales are in its area of distribution, whilst it has occasionally been reported from Victoria. In New South Wales its range is practically confined to that portion of the coast north of Sydney, and in Victoria the records have probably come from pigs imported from the northern infested areas. In Queensland the parasite is known from practically every locality where pigs are bred, the more heavily infested districts comprising the coastal areas, especially those of the tropical north.

Figures supplied during the months November, 1930, to February, 1931, showed that infestation of the area from Rockhampton north was 62·1 per cent., of south-eastern Queensland including the north and south coast and Moreton areas, 32·5 per cent., and of the Toowoomba-Warwick districts only about 2·5 per cent. Research has shown that the free living stages of the parasite are dependent, among other things, on the maintenance of moist conditions. The higher the rainfall, therefore, the more suitable would conditions be for its development. This is shown by a heavy northern infestation which is associated with an annual rainfall which may be as high as 158 inches, by a smaller

THE KIDNEY WORM OF PIGS (*Stephanurus dentatus* Diesing).

(*Description of Plate, page* 299.)

Fig. A. This photograph represents a normal healthy liver obtained from a pig free of kidney worms. Note the evenness of its surface and the dark uniform colour.

Fig. B. A liver taken from a pig heavily infested with kidney worm. Compare the appearance of this liver with that above. Note the pale mottled appearance and the unevenness of its surface. The excessive growth of the connective tissue is very conspicuous especially towards the edges of the lobes. The numerous, whitish, raised areas represent places in the liver where the liver substance has been completely replaced by connective tissue. These areas extend into the liver for various distances and abound in worm tracts. The parasites causing all this damage had all migrated to the kidney fat from which sixty-two worms were collected. The very appearance of such a liver amply demonstrates the severe drain that kidney worm infestation has on the health of the pig.

PLATE 80.—THE KIDNEY WORM OF PIGS (*Stephanurus dentatus* Diesing).
(*For description of Plate, see page* 298.)

southern infestation with a rainfall of 34 to 45 inches, and by a light infestation of the Toowoomba-Warwick area where the rainfall is only 27 to 36 inches.

Temperature is also probably an important factor. The optimum temperature for the development of the free living stages has been shown to be in the vicinity of 75 deg. to 80 deg. Fahr. Temperatures below 75 deg. Fahr. have been found to retard development, at 46 deg. to 52 deg. Fahr. the development of the egg may be almost entirely suspended, whilst still lower temperatures will bring about total egg decomposition. Examining now the temperatures of the districts concerned—only the minimum temperatures need be considered—it will be seen that those for the coastal areas vary between 55 deg. and 63 deg. Fahr., whilst for the Toowoomba-Warwick district minima of 50 deg. to 53 deg. Fahr. are noted. Moreover, the frequent heavy frosts of this district, no doubt, also assist in reducing the chances of the hatching of the egg and the development of the larva.

The influences of rainfall and temperature are also shown in the reported heavier infestation of pigs slaughtered during the winter months. From about May to August the percentage of infested pigs is said to be higher than at any other time of the year. This is, no doubt, due to the fact that the eggs laid in summer, from which the adults found in the winter have developed, are provided with warmth and adequate moisture for their development by the summer temperatures and rains, whilst if deposited during the winter they would be subjected to the adverse cold and dryness of the season.

Life History of the Kidney Worm.

In order to reach maturity the kidney worm must inhabit the kidney fat. In other situations eggs are not deposited and it seems that these organs are attacked only during the migrations of the parasite within the body in an endeavour to reach these fatty tissues. In the perirenal and periuretal fat, the cysts containing the worms are connected by fine canals with the ureters, through which the eggs pass with the urine to the bladder, eventually reaching the exterior.

The egg (Plate 78, fig. 1), when passed out, measures only about 1/250th of an inch in length with a breadth of about 3/1250th of an inch. It is then in an advanced state of segmentation and under favourable conditions of temperature and moisture will hatch in one to two days. The newly hatched larva is little more than three times the egg length and moves about very actively in the moist earth in which it lives. After some hours of activity it lies motionless for a little time and eventually sheds its skin. The second stage larva is very similar to the first and also has periods of activity and rest. A second moult occurs but is not complete, and the larva, which is approximately twice the length of the first stage, remains encased in this moulted skin. This stage is reached in five to eight days after the egg has hatched. (Plate 78, fig. 2.) It is by larvæ of this type only that the pig may become infected. These larvæ gain access to the pig in two ways, they may be taken in with food and water, or they may burrow through the hair follicles of the skin. They eventually reach the liver, where they remain for some time, developing and feeding on the liver tissue. After a period of five or six months the worms are in the adult stage, and, leaving the liver, make their way to the kidney and uretal fat, where at last they become mature and lay eggs.

Control.

In the life cycle of the kidney worm there are two distinct stages, a preparasitic or free living stage which is spent in the soil outside the body, and a parasitic stage which is spent in the tissues of the host. The parasite may be said to be confined to the pig, as it is extremely rare for any other animal to be infested. This knowledge somewhat simplifies control measures as only the pig and the conditions under which it is housed need be considered.

Since the worms are embedded in solid material and located in tissues not connected with the digestive tract, treatment with drugs in the ordinary way is practically useless. In such a case, therefore, preventive measures are of more than usual importance. Control measures, which may be successfully applied to maintain worm-free herds, are:—

(1) Clean pigs should not be allowed to come into contact with infested pigs or their secretions. Pigs should be excluded from all grounds known to be infested—i.e., grounds on which infested pigs have been running or which are connected in any manner whatsoever, by drainage, &c., with other grounds on which infested pigs have been allowed to graze.

(2) If the animals are stied, the sties should have concrete or asphalt floors or be built of slabs raised above the ground, allowing the urine to drain through.

(3) Food troughs should be built so that the animal is unable to place his feet in the trough and so carry infection from the ground directly into his food.

(4) Under suitable conditions of heat and moisture the mature larva is able to survive as long as about five months. A sty or paddock which is suspected as being infested would therefore require to be spelled at least six months before being judged safe for restocking.

(5) Investigations have shown that sunny, dry conditions are very unfavourable to egg and larval development, an exposure of thirty to sixty minutes to these conditions being ample to ensure the decomposition of the eggs and the death of the larvæ. The utilisation of this knowledge opens up a fairly straightforward method of control. Sties and paddocks should be so situated that they receive the maximum of sunlight. An efficient drainage system is required so that dry conditions may be maintained. Special attention should be given to those areas constantly kept moist through the accumulation of urine. Frequent turning over of this heavily contaminated soil will expose larvæ and eggs to the sunlight and aid in obtaining a more rapid evaporation of the moisture. In small paddocks ploughing and harrowing will be found advantageous in maintaining dry surface conditions. Wallows, if considered necessary to pig welfare, should be constructed of concrete and kept scrupulously clean. Mud wallows should be eliminated, as they constitute one of the primary sources of infection.

(6) The Department of Agriculture and Stock is willing to assist in determining whether any suspected pig is infested with this parasite. A small quantity of the urine should be caught in some way or other and forwarded to the Department, where it will be examined for the presence of eggs.

GLOSSARY.

The *perirenal and periuretal tissues* refer to the heavy layers of fat which surround the kidneys and ureters.

The *ureters* are the ducts leading from the kidneys to the bladder.

The *lumbar region* comprises the tissues in the vicinity of the lumbar vertebræ—i.e., the loins.

The *costal region* concerns the ribs.

The *diaphragm* is a muscular partition separating the thorax from the abdomen.

The *pleura* is the membrane lining the thorax. There are two pleura, each lining one side of the thorax and the adjacent lung.

A *pathological lesion* in a tissue is an injury resulting directly or indirectly from the presence of a parasite. The liver is divided into a number of more or less distinct lobes by fissures or clefts. The liver substance consists of minute *lobules* enclosed and separated from one another by *interlobular* or connective tissue. Each lobule is composed mainly of a number of microscopic cells, the *hepatic cells,* which are concerned in the secretion of bile.

Toxins are highly poisonous substances.

The *renal glands* are situated near the kidneys, the *portals* near the liver, and the *mesenterics* in the large membranous sheet, the *mesentery,* that is suspended from the abdominal wall and supports the intestines.

The *peritoneum* is a membrane lining the abdominal cavity.

The *pelvis* of the kidney is the internal cavity.

The *lumen* of a blood vessel is the cavity through which the blood flows.

REFERENCES.

Baylis, H. A. Helminthology, Medical and Veterinary, London.

Boynton, W. H. Kidney Worm Infestation of Swine in the Philippine Islands, with Special Reference to the Pathological Changes, Phil. Jour. Sci., vol. 9, series B, No. 3.

Daubney, R. The Kidney Worm of Swine, a Short Redescription of *Stephanurus dentatus* Dies., 1839. Jl. Com. Path. and Ther., vol. 36, p. 97.

Drabble, J. The Kidney Worm of Hogs in New South Wales, *Sclerostomum renium* n.sp. Ibid., p. 217.

Johnston, T. H. Notes on Some Entozoa. Proc. Roy. Soc Q'ld., vol. 24.

Ross, Clunies, I., and Kauzal, G. Preliminary Notes on the Preparasitical Stages of *Stephanurus dentatus.* Aust. Vet. Jour., vol. v., No. 2.

Ross, Clunies, I. The Kidney Worm of Pigs: Its Growing Importance to Australia. Jour. Coun. Sci. and Ind. Res., vol. iv., No. 1.

Schwartz, B., and Price, E. W. The Life History of the Kidney Worm. Science, 70 (1929), No. 1825, pp. 613-614.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

DEPARTMENT OF AGRICULTURE AND STOCK.

VISIT OF SCHOOL CHILDREN.

In this time of difficulty, to the land we turn naturally as the source of our national stability. Primary production is the real material wealth of Australia. Prosperity for commerce and community services can only come from rural industries.

To you young people I therefore commend the consideration of the possibilities of a career on the land in your own country. Its attractions and its rewards, the really worth while things of life, far transcend those of the city. From my own experience as a farmer, I can assure you that country life and work have compensations, material and otherwise, to which the artificialities of the city cannot be compared.—HON. HARRY F. WALKER.

SUGGESTED by happy thought, arranged by Mr. Richard Hill, M.L.A., and welcomed cordially by the Minister of Agriculture and Stock, Hon. Harry F. Walker, several parties of scholars from the Kelvin Grove Electorate visited the Department of Agriculture on Thursday, 9th April.

HON. H. F. WALKER.

The object of the visit was to impress on the minds of the children the great importance of agriculture and animal husbandry in the economy of the Commonwealth. Also to give them an insight into the immense value and wide range of Departmental services to the man on the land.

The visiting scholars numbered 150—thirty-eight boys from the Kelvin Grove Boys' School under Mr. A. J. Collins, A.T.; fifty-six girls from Kelvin Grove Girls' School under Misses M. J. Carraway, H.T., and N. Burke, A.T., and Messrs. V. W. Wilson and G. A. Henley, student teachers; and fifty-six boys and girls from Ithaca Creek School under Messrs. A. E. Blunt, H.T., and R. J. Cochrane, A.T.

WELCOMED BY THE MINISTER.

On arrival at the Department each group was received by the Minister, Mr. Walker, who addressed the children briefly. Other short addresses were delivered by Messrs. E. Graham, Under Secretary, R. Hill, M.L.A., and B. J. McKenna, Director of Education. Suitable responses were made by the leaders of each party.

In the course of his remarks, the Minister said that there was nothing finer than to meet so many young Australians all intent and eager to learn something of their great basic industries. In their hands was the future of Queensland and the Commonwealth. Their visit was evidence of their keenness to know something of the real work of the country. The great training grounds for Australians were the home, the garden, and the farm, and their healthy environment. The encouragement of country life and the preservation of "country" conditions in their cities made for the health and happiness of the people. It was not, however, what people knew, so much as what they were. The best of all fine qualities they were cultivating was character, the character with which they would face fearlessly and independently the problems of after life. Those problems they would tackle with frankness, freshness, and vigour, having learnt in their schools and on their playgrounds the value of quick decision and keen enthusiasm in all the tasks they undertook. As a nation they had set up high standards, and those that they had in mind were in most cases the standards of the bush, from which, after all, they had really acquired their national character.

To the man on the land, the Department of Agriculture and Stock, like the Education Department, was one of the most important of their administrative and directive services. That day they would have an opportunity of seeing the scientists and experts of the Department engaged on work of great value to all engaged in the primary industries, on the success of which so much of the prosperity of Queensland

PLATE 81.—KELVIN GROVE STATE SCHOOL (BOYS)—SCHOLARSHIP CLASS.
Seated in the centre, left to right, are Mr. A. J. Collins, A.T., and Mr. R. Hill, M.L.A.

depended. In every branch of farming and stock-raising, guidance was given freely by men of the Department whose personal knowledge of local conditions in every district, skill, and practical experience were at the disposal of anyone engaging in a life on the land. The Department was organised along sound administrative, commercial, and educational lines.

In this time of difficulty they turned naturally to the land as the source of their national stability. Primary production was the real material wealth of Australia, and prosperity for commerce and community services could only come, in the main, from their rural industries.

Mr. Walker then contrasted the conditions of bush life with those of the city to the vast advantage of the former. He expressed his pleasure at receiving the scholars, whose freshness, brightness, and intelligence had greatly impressed him, thanked Mr. Hill for the opportunity of meeting them, and congratulated him on the happy idea that made it possible.

"To you young people," he concluded, "I commend heartily the serious consideration of the possibilities of a farming career in your own country. Its attractions and its rewards, the really worth while things of life, far transcend those of the city. From my own life-long experience as a farmer I can assure you that country life and work have compensations, material and otherwise, to which the artificialities of the city cannot be compared."

The scholars then formed small groups and each, with a departmental officer in charge as guide, commenced in turn a tour of inspection and inquiry. A very instructive and enjoyable day was spent.

Publicity and Record Sections.

In the office of the Editor of Publications the young people were shown how the "Queensland Agricultural Journal" is produced, all the literary and technical processes of journal and pamphlet production being described.

Keen interest was displayed in the Photographic Section where photographs of the children, taken that morning on arrival, were being developed and printed.

In the Despatch Office, modern methods of handling a vast volume of correspondence, and the despatching of the Journal and numerous other publications, were explained.

The Record Room was a scene of busy activity, and there the completeness and efficiency of a modern filing system were demonstrated.

The Library was next visited. Files of current country newspapers, and technical and scientific journals from all over the civilised world were seen, and methods of indexing literature on the Dewey decimal system illustrated.

In the Correspondence Section, the visitors saw a whole battery of typewriters at work on that day's mail. This section interested the girls particularly, and the whole system of dealing daily with voluminous correspondence was courteously given by the young ladies in attendance. The duplicating and other up-to-date office equipment was seen in action, and from the whole room was received an impression of the importance of efficient routine and office administration.

Cotton.

In the Cotton Section the children learnt something of the extent of cotton-growing in Queensland and the quality of the product. To each was handed a sample of fibre in boll and lint.

Sugar.

Moving on, each party in turn entered the laboratory of the Bureau of Sugar Experiment Stations, where the value of scientific tests and investigations was demonstrated most interestingly. Departmental work in soil science, pathological work, and the improvement of technical processes covered a wide field of explanation and demonstration. The inquiring mind of the intelligent youngster is known to every parent who endeavours to satisfy natural curiosity more or less satisfactorily, if not occasionally with irritability, and the science men showed infinite patience and understanding in their ready answers to the volleys of questions fired at them.

Pure Seeds Branch.

In the Seeds, Stock Foods, Fertilizers, and Pest Destroyers Investigation Branch the young visitors were given practical demonstrations of seed testing. Other activities were described in clear and easily assimilative terms. The children were shown how the Department protects the interests of the farmer in respect of the quality of seeds and other substances of which purity is an essential in economic production.

PLATE 82.—ITHACA STATE SCHOOL—SCHOLARSHIP CLASS.

Seated in the centre, left to right, are Messrs. B. J. McKenna, Director of Education, R. J. Cochrane, A.T., R. Hill, M.L.A., A. E. Blunt, H.T., and the Hon. Harry F. Walker, Minister for Agriculture and Stock.

Entomological Division.

The entomological and plant pathological laboratories proved an irresistible attraction to the youthful investigators. To the boys especially, an appeal was made to help in the preservation of our insect-eating birds, the feathered friends of the farmer. The museum where were exhibited, in specimen and excellent drawing, many of our animal and vegetable pests, also insects beneficial to man and his industries, was another mine of information to the enthusiastic inquirers.

Animal parasites were shown under the microscope in the parasitologist's laboratory, while in an adjoining room the tinest of insects were examined in all the detail of their bodily formation in the ray of a powerful projector. The Departmental illustrator was also seen at work on wonderful drawings of harmful insects and the effects of their ravages, for reproduction later in the Journal. So interested were the visitors in the work of the scientific services generally that the time of their tour had to be extended.

Laboratory of the Agricultural Chemist.

A move to the laboratory of the Agricultural Chemist followed, and there was observed in progress much important analytical work which covered a wide range of service of great importance to the manufacturing as well as the producing side of rural enterprise in Queensland.

Meat Inspection Depot.

Interesting explanations and demonstrations of methods employed at the Central Meat Inspection Depot, within the precincts of the Department, followed. The vast value of this work, especially from a public health point of view, was impressed on the young people. Meat was condemned in their presence and reasons were given and taken down in rapidly filling notebooks.

Wool Room.

In the Wool Room adjoining, all classes of fleeces from farmers' flocks were displayed. "Tops," "counts," and other technical terms were defined, and as much information that could be crowded into a limited time was given on the value of Queensland's great wool industry.

Cotton Classing.

From the Wool Room to the Cotton Classing Floor was a step or two, and there Queensland cotton was arranged in various grades and classes alongside samples from the United States for comparison.

Wheat and Maize Breeding.

Entering the Seed Room, the children were confronted with long tables laden with grain in husk and sheaf. In great variety were displayed the impressive results of scientific grain breeding. The system of wheat and maize propagation was explained in detail. The youngsters, no doubt, left convinced by practical object lesson of the substantial value of the services of the Department in grain production in Queensland.

Herd Testing.

Officers of the Dairy Branch were then seen at work testing cream samples in connection with their important work of herd improvement. Every normal youngster, whether its the works of a watch or a wheelbarrow, is interested in "wheels going round," and to see actual processes, of which they had formerly but a hazy knowledge, if any, was to them an absorbingly interesting experience.

The "Picking Over" Floor.

One of the most popular experiences in the day's itinerary was the visit to the picking over floor where a large consignment of seed potatoes was under examination for potato fly. The officer in charge explained the importance of the precautions taken against the introduction of fruit and vegetable pests and the means taken to prevent it.

A couple of cases of luscious pears and apples, the product of Queensland orchards brought from the markets that morning, were placed on a stand so that the youthful visitors might apply practically, by invitation, what they had learnt of the art of "picking over." With sharpened appetites the task was completed in record time.

PLATE 83.—KELVIN GROVE STATE SCHOOL (GIRLS)—SCHOLARSHIP CLASS.

Seated in the centre, left to right, are Miss N. Burke, A.T., Mr. R. Hill, M.L.A., and Miss M. J. Carraway, H.T., Messrs. V. W. Wilson and G. A. Henley, student teachers, are on the flanks.

Essay Competition.

Observing the keen and intelligent interest displayed by the scholars, Mr. Walker announced that he would give prizes to two pupils from each of the three schools who submitted the best essays on the subject of the impressions of the purposes, value and importance of the work of the Department of Agriculture and Stock, based on their visit. In addition, Mr. Hill promised to give a medal for the best essay submitted from all of the three schools.

Light luncheon for the young people was provided by the Department of Agriculture and Stock, and among those present in the course of the day were Messrs. F. W. Butler, M.L.A., and B. J. McKenna, Director of Education.

Before returning to their respective schools, thanks were expressed to the Minister and his officers by Messrs. Blunt and Cochrane (Ithaca), and Mr. Collins, of Kelvin Grove. Hearty cheers were given by the children for Mr. Walker and his Department, which were acknowledged on their behalf by Mr. R. P. M. Short.

PSEUDO POULTRY PLAGUE.

THE heavy mortality that has followed an outbreak of pseudo poultry plague in the various countries where the disease has occurred has served Australia in good stead; for immediately a definite announcement was made of its presence in Victoria the Department of Agriculture in that State instituted a most rigorous system of quarantine. The early action taken is responsible unquestionably for the prevention of the spread of the trouble.

As the disease is of such a serious nature, and Queensland breeders are unfamiliar with the general symptoms, the following extract from an article by R. N. Johnstone, B.V.Sc., in the "Journal of Agriculture," Victoria, is reproduced herewith for their information:—

"The first symptom noticed is that the bird becomes sleepy and will stand by itself, the tail droops, and every now and again the bird will shiver or make a convulsive movement. If grain is offered, the bird will pick at it in an unconcerned way. The respirations are increased. There is a watery, yellowish-white, foul-smelling diarrhœa. As a rule, the crop is distended with a sour-smelling greyish-brown fluid.

"In the majority of natural cases there is a thick mucous discharge from the nostrils, and in the mouth a varying amount of frothy exudate which occasionally hangs in threads from the end of the beak. The comb and wattles become dark in colour. The most characteristic symptom noticed is in connection with the respiration. There is a long, gasping inhalation through a half-opened beak. Death usually occurs between the third and sixth day after symptoms develop. Occasional birds may die without showing any symptoms. A few may live much longer, and some may even recover. These birds, however, become partially paralysed as the disease progresses, and those which continue to live remain paralysed in one or both legs, or have their necks distorted, and are quite useless for practical purposes.

"As with most diseases of this nature, the post mortem lesions are not constant. As a rule, however, the skin and muscles will be found to be slightly darker than normal. In the fat around the gizzard a number of dark-red blotches, due to hæmorrhage, are noticed. The small bowel immediately behind the gizzard shows hæmorrhagic blotches. The lining of the sac immediately in front of the gizzard—the proventriculus—is found to be hæmorrhagic. The sac around the heart sometimes has an excess of fluid. The contents of the bowels frequently consist of liquid only, and are grey in colour.

"The droppings, the discharge from the mouth and nose, the blood, and every portion of the body of the bird are infectious; and, therefore, the disease may be spread by feeding birds on hotel offal which may contain uncooked portions of affected birds or bread scraps, leaves, or peelings of vegetables which have been soiled by the hands of persons who have stuffed and trussed birds for cooking, or shells of eggs which have been soiled on an infected farm. It may also be spread by fowls which come in contact with infected birds in markets, or which are placed in crates or coops which have been occupied by infected birds, or soiled by their droppings. It may also be carried from one pen to another or from one farm to another by persons whose boots have become soiled with the droppings of infected birds."

POULTRY DISEASES—I.

By P. RUMBALL, Poultry Expert.

IT is impossible in the course of a paper—or several papers, for that matter—to deal fully with the question of diseases in poultry. I trust, however, to be able to cover many of the disorders met with in Queensland. With some troubles many will be familiar; but it is hoped that those breeders will bear with me, as beginners are constantly entering into this industry—hence the necessity of referring to the simplest ailments.

On account of the heavy mortality that is at times experienced, and the economic loss to the industry, the question of disease must receive more serious attention in the future than has been the case in the past. This is necessitated by the ever-increasing competition and the consequent need of getting costs down to bedrock. The time when one would say, "It is only a hen, or a few chickens," is gone. For the moment the loss of a few birds may not amount to much, but in the aggregate it means a good deal to the industry, and at the end of the year a lot to the individual breeder.

It is not suggested that time and money be spent in treating individual birds, but rather that at all times methods more suited to the prevention of disease should be adopted, and it will be readily understood that it is only by having some knowledge of disease that efficient means of prevention may be employed.

There are, however, diseases that enter the poultry-yard despite all precautionary methods, and when the disease is of an epizootic nature time and money must be spent in the treatment of birds. The breeder will have to be guided by circumstances and weigh the advisability of persevering with methods of treatment and eradication as against a stamping-out process by the destruction of sick birds. The trouble is that in most cases the disease has spread to more than one pen of birds before it is noticed, and is more or less of a general nature.

As the highest mortality in the poultry-yard is usually among chickens and growing stock, it is considered that the troubles affecting this class of stock should receive prior consideration before passing on to the question of disease of a general nature. Incidentally, a breeder will generally evince a greater interest in adult stock that are the result of successful rearing than he will in a flock reared through constant trouble. Again, the health and stamina of adult birds depends a good deal upon efficient rearing.

First Principles.

As previously mentioned, many of the diseases and disorders in poultry-raising can be guarded against. This is particularly so with chickens and growing stock, and, although the question of disease is being discussed, I cannot refrain from referring to a few principles of brooding of importance to the health of the birds. With any type of brooder it is essential to maintain a correct temperature, for excessive heat has a weakening effect; whereas if the temperature is too low the chickens will crowd, become over-heated, and probably be more weakly than those that were supplied with an excess of artificial heat. It is essential to provide a pure-air supply without draughts, and to bear in mind the fact that, as chickens grow, they require more air.

Another essential is exercise; get them running out in the sun as much as possible, as sunlight assists in development, but at the same time provide shade. Avoid overcrowding stock in either brooders or houses. Keep the brooders and all equipment scrupulously clean, and feed only wholesome foods. Although economy in rearing is essential, it does not necessarily follow that the cheapest food will give satisfactory results. The quality of a food generally governs its price.

The Wisdom of Close Observation.

There are certain well-defined symptoms among sickness in young growing stock that enables one to gather the nature of the disease or the trouble, and it is essential that the breeder acquires the art of detecting any sign of trouble immediately on entering his brooder-house, his rearing-pens, &c., in the course of his daily duties. It should not be necessary to make a special inspection of the farm for the purpose of detecting sick birds. The breeder should school himself until, to him, the most prominent bird in the flock is a sick one. When he has done this, he is able, to a large extent, to prevent the various troubles from extending to dangerous proportions. For instance, if, on visiting the brooder-house, it is noticed that chickens are picking

the toes of another chicken, it is palpable that "cannibalism" is present, and, if no immediate action is taken, the trouble will spread until the vicious habit assumes serious proportions.

In the first week or two chickens frequently droop their wings, are listless in appearance, and pasted up around the vent. This is evidence of simple diarrhœa. If from two weeks onwards up until, say, twelve weeks, chicks droop their wings, the tips of which are frequently soiled, appear to lack energy, and are passing reddish droppings, coccidiosis should be suspected.

Chickens during the first week or two of their lives often become wet and dirty around the eye. This is evidence of what is termed "sore-eye." Once they have left the brooders, birds with eyes that are moist and discharging, faces probably swollen around the eye, with a mucous discharge from the nostrils, and, frequently, dirty wing-bows, are most likely afflicted with colds.

Unthrifty chickens—chickens that are making poor growth, thin and pale in the shank, roughened in plumage—may be infested with lice, particularly head lice with hen-hatched chickens, or preyed on at night by mite, or infested with intestinal worms. A careful examination will indicate to the breeder the cause of the trouble.

If the chicken, from a few weeks of age onwards, experiences difficulty in walking, but is normal otherwise, the trouble is probably due to what is known as leg-weakness. If small yellow pimples are noticed on the comb and bare portions of the head, later becoming enlarged and darkened and much like a wart, the trouble is chicken-pox.

The foregoing will facilitate the diagnosis of many of the troubles common to chickens and young stock. In the more obscure cases it will be desirable to resort to a *post mortem* examination, which will be dealt with later, but, in order that breeders may be enabled to treat those already indicated, brief reference to the cause and treatment is given.

CANNIBALISM, TOE-PICKING, &c.

Cause.—This is not a disease, but a condition that is frequently brought about by wrong conditions and accidents. The trouble is noticed in adult stock, as well as in chickens of all ages.

With very young chickens it is frequently due to over-crowded conditions in the brooder and undue confinement—the lack of activity; or it may commence by a chicken accidentally injuring a toe or some other portion of the body, causing blood to flow. Poultry, both young and old, readily acquire a taste for blood, and the vicious habit of pecking and disembowelling one another rapidly spreads.

Among hens the cannibalistic habit is frequently caused by one bird having a true case of prolapsis of the oviduct. The red protruding mass attracts the attention of others in the pen. They peck at it, cause blood to flow, with the consequence that the more vicious of the flock develop the habit of pecking the vent of any hen while straining to lay. This pecking causes the part to become inflamed. This makes it difficult for a bird to lay, lengthening the period of straining, with the result that the part is again pecked, and in many cases the bird is disembowelled.

Treatment.—Remove the affected birds. With chickens, promote exercise by feeding frequently, and endeavour to keep them active by feeding succulent green feed for them to tear about. Increase their liberty as much as possible.

In the case of hens, as the trouble occurs through attacks while laying, darken the nests and make the conditions as secluded as possible. This, it will be found, will frequently correct the trouble, but, at the same time, if it is possible to increase the liberty of the birds in order to prevent a number gathering together with nothing to do, the correction of the trouble is facilitated.

SIMPLE DIARRHŒA IN CHICKENS.

Diarrhœa in poultry is of such a widespread nature that it is as well to confine our attention to one phase of the disorder and to treat general diarrhœa under a separate heading.

Cause.—The trouble is principally due to chilling and over-heating. Experiments conducted show that the mortality in chickens subjected to chilling during the first week of their lives amounted to 75 to 80 per cent., while chilling during the second caused a loss of 15 to 20 per cent. There was also a great disparity in the body development of the chickens which had been chilled as compared with those that had been correctly brooded.

The feeding of chickens too soon after incubation retards the assimilation of the yolk which is drawn into the abdominal cavity just prior to hatching, with the result that a certain amount of fermentation takes place, sometimes causing diarrhœa.

Treatment.—Correct the conditions. Flush the system with Epsom salts by dissolving the right quantity in sufficient water to mix a wet mash. In feeding this mash, spread it well out so that each chicken has an opportunity of obtaining its proportion. The quantity of salts to be administered per 100 chickens varies according to their age. Chickens under five weeks should receive about 3 oz., and for every additional four weeks add 1 oz. per 100 birds.

COCCIDIOSIS.

Cause.—Coccidiosis is caused by a microscopic parasite termed Eimeria Avium, which, when taken into the digestive tract by susceptible chickens, rapidly develop and multiply on the walls of the intestines, particularly the cæca or blind gut.

This organism passes through many stages during its life cycle, which it completes in a period of about five to six days. The infection spreads from bird to bird by medium of the droppings, and is capable of remaining dormant in the soil for a period of over twelve months. Wild birds, as well as chickens and adult poultry, are susceptible to the disease, but in adult fowls the mortality is not excessive.

It will be seen, however, that the two main sources of infection are the soil and the adult, and that it is possible for the disease to be spread by a wild bird, the running of adult stock in the chicken pens, and by means of droppings adhering to the feet of the attendant.

A *post mortem* examination materially assists in a field diagnosis of this disease. The upper portion of the small intestines may be found in an inflammatory condition. Blood may also be present among its contents. These conditions in young chickens are usually more pronounced in the cæca, which is frequently distended with blood. Blood, however, in the intestines is not a consistent symptom.

PLATE 84.—CHICK WITH COCCIDIOSIS IN SEVERE FORM.

Note the tips of the wings are stained with blood.

Treatment.—This consists of protecting the birds against infection and the feeding of liberal quantities of butter-milk. Dr. Kerr, of the National Poultry Institute, has recently intimated that a combination of iodine and milk is a most effective form of treatment. This method, however, has not been tried in Queensland, but highly satisfactory results have followed the practice of feeding extensive quantities of butter-milk, combined with strict sanitary methods.

As the organism responsible for the trouble is voided with the excreta, it follows that the best means of protecting the birds from infection is to avoid, as far as possible, contamination of the water and food supplied. The receptacles should be

so placed that the chickens cannot foul them. As chickens are constantly picking up particles of food, &c., from the floor, and as the organism, two days after being voided, is in a suitable state to pass through another stage of development once it is consumed, it indicates that the pens and houses should be cleaned at least every forty-eight hours. In the cleansing of the pens reliance cannot be placed upon the destructive powers of an ordinary disinfectant. Consequently, the places in which the chickens are housed must be thoroughly cleansed of all loose material. It also follows that the practice of feeding grain in the litter or on the ground should be discontinued. In fact, during the height of the trouble it is advisable to cease feeding grain. In cases of severe outbreak the removal of all food and the feeding of pure buttermilk for a day, followed by the feeding of a mash containing 20 per cent. of buttermilk for a period of six days, then breaking it down to a 10 per cent. mixture, is recommended. If the case is not very severe, commencing with a 20 per cent. buttermilk ration will be found effective, providing it is assisted by strict sanitary measures.

Buttermilk powder possesses the desirable feature of being nutritious and at the same time has laxative properties. It is a most valuable food, and should be fed by poultry farmers as a protective measure. Its use at the rate of 10 per cent. eliminates the necessity for any other form of animal protein.

SORE EYES.

This is not a disease, but a condition due to an irritant of some nature gaining entrance to the eye, causing it to water freely, and dust to adhere. The eyelids do not become glued together as in the case of colds, but just have a moist, dirty appearance. This trouble has been noticed where breeders have used chips for litter in which emery powder is present.

The treatment consists in removing the cause and renewing the litter when it becomes dirty and dusty.

COLDS.

Cause.—Ordinary colds usually occur on account of the lack of ventilation, or over-crowding, or due to draught. They are rarely noticed in flocks with ample run and well housed.

Treatment consists in the removal of the cause, flushing the system with salts, and, when the eye is inflamed, to place in it two or three drops daily of a 10 per cent. solution of argyrol. Many colds are of a contagious nature, and it would probably be wise to medicate the drinking water with permanganate of potash or some other suitable disinfectant. If the birds become at all feverish, aceto-salicylic acid at the rate of a quarter of an ounce to the gallon of drinking water should be added. To increase its solubility, potassium or sodium carbonate should be added in small quantities.

PARASITES.

The parasites to which chickens and growing stock are subject may be classified as internal and external. Among the external are the tick, mite, and body lice of all kinds.

The Tick.

Description.—The seed tick before feeding is naturally small and almost white in colour. It has six legs. After feeding it swells considerably and becomes darkened. The adult tick is a bluish-grey in colour, oval in shape, more or less flat, and varies in length from one-eighth to three-eights of an inch. The adult has eight legs.

The tick is a parasite which, in the first stage of its life (four to ten days), lives upon the body of the bird, frequently under the wing, both night and day. After this it will be found in the cracks and crevices of the fowlhouse, only leaving those secluded positions at night to feed upon the bird. It lives by sucking the blood. Unfortunately, the tick at times carries an organism which, during the process of feeding, gains entrance to the blood stream of the bird, causing tick fever, to which the birds readily succumb.

Treatment consists in eradication by spraying the house with some suitable mixture. A 10 per cent. kerosene emulsion has been found to be very effective. Creosote, or some wood-preserving oil, is also most efficient when painted or sprayed on the building. As there is a possibility of seed tick being on the bird at the time of spraying, it is necessary to repeat the process at suitable intervals in order to destroy those that leave their host after the first spraying.

Mites.

There are two classes of mite which cause poultry-raisers trouble in this State. These are commonly known as the red mite and the tropical mite. They are both very minute, and even when fully grown are not much larger than the dot used above the letter "i." They also have eight legs when mature, and when engorged with blood are red, but before feeding are of a greyish colour.

Habits.—The mites live in the cracks and crevices of the poultry-house, and when very numerous are found among the droppings. The red mite feeds on its host at night, seeking seclusion during the day. The tropical mite will feed at any time, and is frequently noticed on birds in the yards during the daytime. Their

PLATE 85.—SEED TICK ATTACHED TO FOWL.

favourite position is among the feathers just above the hock joint. This mite is different in this respect to the red mite. It will also reproduce without leaving the bird. Consequently, the method of eradication of this kind of mite is slightly different from that of the other. Another means of distinguishing between the two mites is that of movement, the tropical mite being the faster of the two, and when a house is infested with tropical mite it is only necessary to place your hand on the nest box, the perch, &c., for a few minutes before it is covered with the pest.

Treatment consists in both cases of spraying. Similar solutions can be used for the mite as for the tick. The sprayings want to be repeated at intervals of about a week until eradication is completed. With tropical mite, it is as well to dip the birds in a solution of Black Leaf 40 at the rate of 1 oz. to the gallon of water. Dipping needs to be done on a day when the birds are not likely to become chilled.

PLATE 86.—PIECE OF OLD SPLINTERED WOOD INFESTED WITH FOWL TICK.

Body Lice.

There are many varieties of body lice. Each species of bird has its own particular variety. With the exception of head lice, unless they are numerous they do not cause any material damage. With head lice, however, young growing birds quickly succumb to the attacks of a few. As the name would indicate, this louse lives around the head and on the higher portions of the neck of the bird. It is a louse of about one-tenth of an inch in length, darkish in colour, and is only noticed at the base of the feather where it enters the skin. On account of the position it occupies, it is difficult to detect and needs to be carefully searched for. On adult stock they appear to cause little ill-effects unless very numerous, and then they appear to be responsible for a form of paralysis.

Treatment.—A dust bath, composed of fine road dust and wood ashes, to which may be added small quantities of flowers of sulphur, tobacco dust, or slacked lime, will be found an efficient means of keeping birds free from body lice when they are penned under more or less intensive conditions. On free range the preparation of a dust bath is not essential, as the fowls find suitable spots for the purpose. With the head louse, it is necessary to catch every chicken affected and lightly smear the feathers around the head and under the beak with olive oil. The fumes from Black Leaf 40 painted on the perch in light quantities no more than half an hour before the birds go to roost is also a most effective means of keeping adult and growing stock free from lice when kept under intensive conditions.

Internal Parasites.

Among the internal parasites there is a variety of round worm varying in length from three-eighths of an inch to 3 inches. The thickness of these worms varies in the like proportion. In Queensland worms of different varieties have been found in the crop, stomach, gizzard, intestines, and the blind gut. In the blind gut will be found the small worm which is probably the most common of the round worms. In addition to the round worm, there are tape worms of many varieties. These vary in size to a greater extent. Some require a hand lens to detect, while others are a foot or more in length. The round worm in the intestines lays its egg, which is voided in the excreta, where it undergoes partial

development. The bird consumes the partly developed egg with particles of food, and on entering the digestive tract it hatches and commences to feed according to its habit, matures, and lays eggs, which are again voided.

The tape worm is made up of a number of segments, and as each segment ripens it is voided with the excreta. This segment contains the pure egg. Flies, slugs, and worms feast on the droppings, taking the eggs into their digestive tracts. Here the egg hatches, the young penetrating the walls of the intestines, encysting itself in the abdominal cavity. The fly, slug, or worm is then eaten by the bird, and an adult tapeworm develops from the encysted stage.

Prevention.—Since the round worm is spread from bird to bird by worm eggs, the following practice should be adopted:—

Never introduce infested stock on to clean premises.

Avoid rearing chickens on land where adult stock have been running.

Have chicken-rearing pens in a position not easily fouled with the washings from adult pens.

Regularly clean poultry houses and pens to reduce the numbers of worm eggs about the premises.

Keep poultry houses and pens as dry as possible.

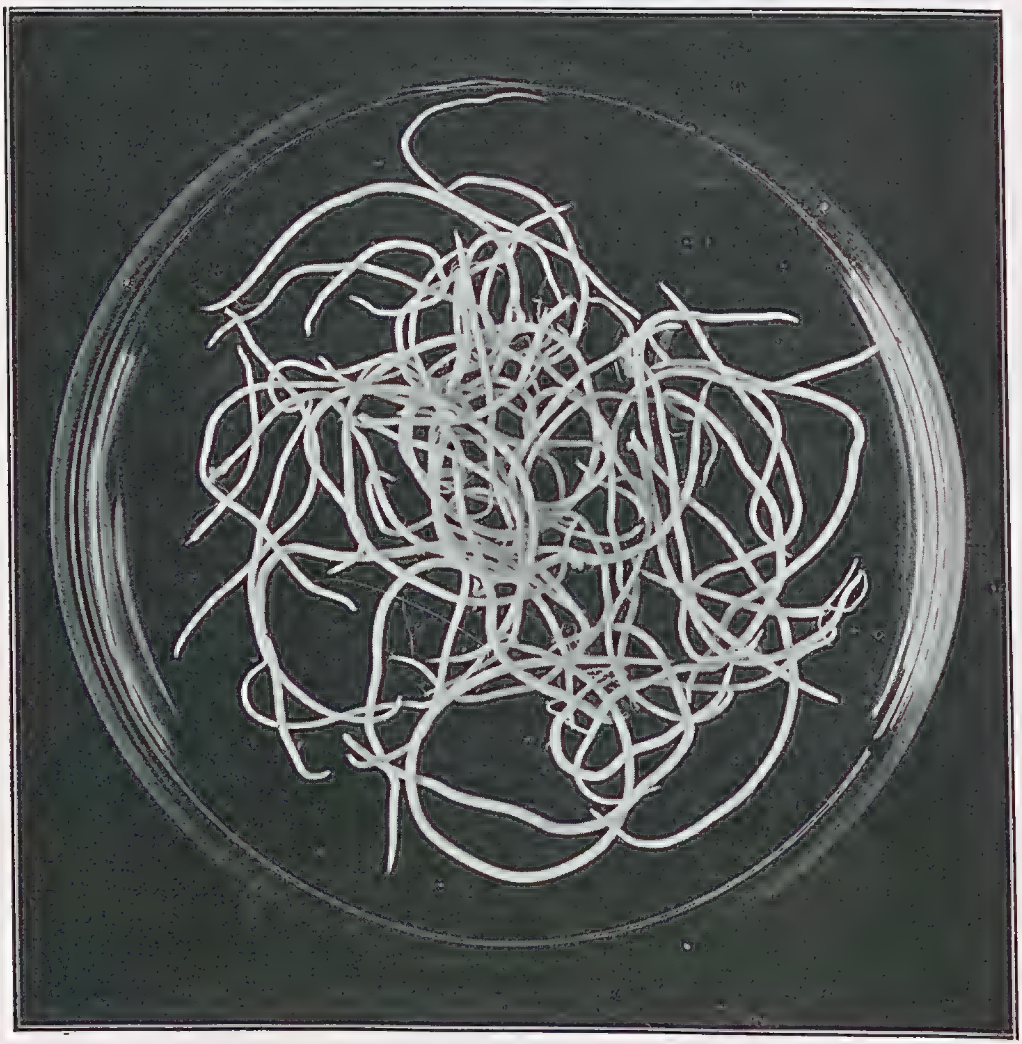


PLATE 87.—LONG ROUND WORMS (NATURAL SIZE) WHICH WERE REMOVED FROM INTESTINES OF FOWL.

It is seen that tape worms require an intermediary host, and that they feed on the excrement containing segments of the worms. The regular cleansing of poultry houses and yards will reduce to a great extent the possibility of the tape worm coming in contact with the intermediary hosts.

Moist places such as under boards, bags, and feed hoppers are favourable places for slugs and worms to find cover. Therefore, do not have yards littered with such.

Treatment.—No medicament is 100 per cent. efficient, and all treatment needs to go hand in hand with prevention; otherwise birds are freed from a few worms only to be reinfested.

Round Worm.—Any of the following will prove fairly effective, but individual treatment is recommended:—

(1) Mix 1 lb. of tobacco dust with every 50 lb. of mash.

(2) One or two teaspoonfuls, according to age, of equal quantities of medicated turpentine and cotton seed or linseed oil. This is best administered with the aid of a syringe and a piece of rubber tubing. Draw the dose into the syringe. Place the tube down the birds throat until the lower end enters the crop; then eject the mixture. This care is necessary, for if the mixture entered the windpipe it would cause asphyxia.

(3) Capsules containing effective worm medicaments could be obtained.

Tape Worm.—(1) One heaped teaspoonful of powdered pomegranate bark added to the mash for fifty birds.

(2) Ten grains areca nut given in mash for each bird.

(3) Kamala at the rate of fifteen grains in mash.

The above is the dose for adult stock. Half-grown birds should receive half the quantity.

Before administering any worm remedies, the birds should be fasted for twenty-four hours. This is best done by not feeding an evening meal and treating stock the following morning. Follow all treatment in the course of two hours with a dose of salts at the rate of 1 oz. to the gallon of drinking water.

LEG WEAKNESS.

Cause.—Forcing chickens too rapidly, feeding them on an unbalanced ration—a ration lacking in mineral matters or vitamins—or too little direct sunshine will frequently cause this disorder.

Treatment.—Feed a well-balanced ration, supplying vitamins by feeding cod liver oil at the rate of 1 per cent., particularly to chickens reared indoors, a ration containing mineral matter, and give the birds as much exercise as possible. The addition of range and the feeding of milk materially assists in preventing the trouble.

CHICKEN POX.

Cause.—A virus which spreads rapidly from bird to bird through contact or by contamination of the water and food supply. It is a disease that affects all classes of poultry, but it is more pronounced among young stock, being most prevalent during the period November to April. Once stock have been affected they are immune to further attacks.

Treatment.—If only a few birds are affected, they should be isolated and the wart-like growths painted with one of the following:—

(1) Carbolised glycerine: 1 part carbolic acid, 15 parts glycerine.

(2) Five to 10 per cent. solution of iodine.

For flock treatment vaccination is being extensively practised in other parts of the world with highly satisfactory results. Vaccination is especially desirable when the disease occurs annually on a farm, and breeders are recommended to take every opportunity of testing for themselves vaccines placed on the market. At present little has been done in Australia in the preparation of a suitable vaccine.

With an outbreak of this disease, it is as well to keep the system flushed with salts and to feed liberally on green feed. The trouble is also frequently associated with what is commonly known as diphtheritic growths in the mouth. The treatment of these will be dealt with under roup.

DIAGNOSIS OF GENERAL DISEASES IN ADULT STOCK.

There are many troubles to which adult birds are subject, and for the breeder to be unaware of the cause of sickness or the death of a bird occasionally is most undesirable.

In most cases the cause can be ascertained by a careful examination of the bird prior to death or by the conducting of a post-mortem examination. The practice of burning or burying dead birds is highly desirable, but unless the cause is sought prior to such action a breeder may remove the first evidence of what may eventually prove a serious outbreak.

Apart from the actual diseased condition being disclosed, there is the physical aspect to be considered, such as the general condition of the internal organs due to feeding, and also as a means of definitely determining to what extent internal parasites are present.

EXAMINATION OF SICK BIRDS.

In the examination of the sick bird it is as well to commence at the head and examine every part of the body thoroughly, as each portion at times assumes a different condition which may be taken as an indicator of some definite disorder.

The following chart will assist in diagnosis:—

Comb	Pale	Intestinal parasites ; Lice ; mites ; Hæmorrhage.
	Purple	Blackhead ; Faulty circulation ; Faulty respiration.
	Deep red	Botulism.
	Tumors or warts	Chicken pox.
Eyes	Watery	Colds.
	Filled with cheesy material	Roup.
	Red and inflamed	Cold.
	Small black specks around	Stick-fast flea.
Face and Wattles	Wart-like growths	Chicken pox.
	Pale and sunken	Worms ; Mite ; Lice.
Head	Vermin base of feathers	Head lice.
Nostril	Clogged with mucous	Colds.
	Same as above ; offensive smell	Roup.
Mouth	Growth on side, roof, and around windpipe	Diphtheritic roup.
Neck	Hanging limp	Botulism.
	Wry neck	Paralysis, Internal parasites.
Crop	Enlarged and hard	Crop-bound.
	Enlarged and soft	Inflammation of crop.
	Content putrid	Botulism
Body	Bluish spots under wings and thighs	Fowl tick.

Abdomen ..	Hard	Internal fat.
	Hard with lump inside	Tumor, Internal layer.
	Enlarged and soft	Dropsy, Cysts.
Vent	Skin around inflamed and feathers soiled	Vent gleet.
	Inflamed material protruding	Prolapse of oviduct.
	Insects around	Lice.
Legs	Roughened	Scaly leg.
	Swollen	Gout.
Feet	Bottoms and between toes swollen	Bumblefoot.
Feathers ..	Unthrifty appearance	Worms, Lice.
	Falling out	Botulism.
Wings	Drooping	Parasites and all acute diseases.

[TO BE CONTINUED.]

QUEENSLAND SHOW DATES, 1931.

Taroom: 4th to 6th May.
Casino, N.S.W.: 5th to 7th May.
Boonah: 6th and 7th May.
Mundubbera: 6th and 7th May.
Charleville: 6th and 7th May.
Murgon: 7th to 9th May.
Longreach: 7th May.
Ipswich: 12th to 15th May.
Mitchell: 13th and 14th May.
Roma: 19th to 21st May.
Gympie: 20th and 21st May.
Emerald: 20th and 21st May.
Atherton: 21st and 22nd May.
Biggenden: 21st and 22nd May.
Kalbar: 23rd May.
Wallumbilla: 26th and 27th May.
Maryborough: 26th to 28th May.
Bororen: 28th and 29th May.
Toogoolawah: 29th and 30th May.
Marburg: 2nd and 3rd June.
Childers: 2nd and 3rd June.
Gin Gin: 4th to 6th June.
Wowan: 4th and 5th June.
Bundaberg: 11th to 13th June.
Gladstone: 17th and 18th June.
Lowood: 19th and 20th June.
Mount Larcom: 19th and 20th June.
Rockhampton: 23rd to 27th June.
Mackay: 30th June to 2nd July.
Kilcoy: 2nd and 3rd July.
Home Hill: 3rd and 4th July.
Townsville: 7th to 9th July.
Gatton: 8th and 9th July.
Woodford: 9th and 10th July.
Cleveland: 10th and 11th July.
Charters Towers: 15th and 16th July.
Caboolture: 16th and 17th July.
Rosewood: 17th and 18th July.
Ithaca: 18th July.
Laidley: 22nd and 23rd July.
Nambour: 22nd and 23rd July.
Esk: 24th and 25th July.
Ayr: 24th and 25th July.
Mount Gravatt: 25th July.
Cairns: 29th and 30th July.
Maleny: 29th and 30th July.
Bowen: 29th and 30th July.
Royal National: 10th to 15th August.
Wynnum: 28th and 29th August.
Crow's Nest: 26th and 27th August,
Imbil: 2nd and 3rd September.
Beenleigh: 18th and 19th September.
Malanda: 23rd and 24th September.
Rocklea: 26th September.
Brisbane River Camp Draft: 25th and 26th September.
Evelyn Tableland: 9th and 10th October.

PIG SECTION AT THE BRISBANE SHOW, 1931.

In order to provide breeders and exhibitors with up-to-the-minute information in regard to the classes in the Pig Section at the forthcoming Brisbane Royal National Exhibition, a preliminary schedule has recently been issued in leaflet form, and is now available on application to the Secretary at Courier Buildings, Queen street, Brisbane.

The Berkshire and Tamworth breeds are provided each with fourteen classes covering boars and sows at various ages—21 months old and over; 12 months and under 21 months; 8 months and under 12 months; 4 months and under 8 months; and under 4 months. Two classes are provided in these breeds for sows and litters—one a class for sows over 15 months, and a new class for junior sows not over 15 months suckling her own litter of not less than seven pigs, which must not be over ten weeks old. Progeny and group classes are also provided. Liberal provision has been made for Poland-Chinas, Duroc-Jerseys, Gloucester Old Spots, Large and Middle Yorkshires, Large Blacks, and Chester Whites, as well as for pigs suited to the pork and bacon market locally and the export trade in frozen pork. Classes are also to be provided for Wessex Saddleback Pigs.

Altogether the section is an attractive one and liberal prize money is provided in all classes.

Entries close early in July and exhibitors are advised to get in touch with the association as early as possible at Brisbane.

PIGS AND PIG PRODUCTS AT THE ROYAL EASTER SHOW AT SYDNEY, N.S.W.

Prevailing low prices had the effect of reducing the entry of stud pigs at this great Show, but good-quality stock were present, particularly in the Large and Middle Yorkshire, Berkshire, and Tamworth classes. In fact, it is many years since there was such a complete high-quality entry in the Yorkshire classes, while the Berkshires were, with but few exceptions, of a high standard. Considerable interest attended the exhibition of the pigs of British breeding (imported) penned in the Yorkshire classes by Messrs. Edward and Elijah Charlish, of Camden, and in the Berkshire classes of Navua Limited, stud stock breeders, of Grose Wold, Richmond, N.S.W. Of the imported pigs the Large and Middle Whites were the most successful, for in every class they, or their progeny, outrivalled locally bred animals, but in the Berkshire classes locally bred animals secured both male and female championships.

The imported Berkshires are generally somewhat longer in the head and body than those bred here, and this usually results in their appearing rather plain and possibly narrow in comparison with the more blocky type, still approved by many of our judges. That the longer-bodied animals must eventually outplace those of more chubby stature was evidenced in the Middle York classes, where some of the exhibits were too short and fat to attract attention.

The Tamworths were represented by but half a dozen animals, and though these were of good quality the breed suffered considerably by comparison. No other pure breeds were penned, and the pork and bacon pig classes were not as liberally supported as is desirable.

Mr. Shelton, of the Queensland Department of Agriculture and Stock, judged the Yorkshires, Mr. G. A. Bedwell the Berkshires, Mr. A. F. Gray the Tamworths, and Mr. John McLean the pork and bacon classes.

The Hams and Bacon Section was well filled and entries were to hand from most of the principal factories in New South Wales, including the Queensland Bacon Association. Meat cured under what is tentatively called the "new cure" was much in evidence and created interest, for it is much brighter in colour and is milder than the more matured meat that has been popular in the shows in recent years. Some of the meat shown was overfat and the comparison between overfat flitches and hams carrying insufficient fat was marked, the judge (Mr. A. E. Sweaney, of Inverell, N.S.W.) commenting on this fact, and recommending exhibitors to select their show bacon from sides that are generally heavier than is desirable for local trade. The taste to-day is for a very mill, bright-coloured, fleshy bacon and ham, and brands carrying these desirable features are more popular than the heavier grades that do not hold their colour so well and that carry more than the desirable quantity of fat.

On the whole, both the Pig Section and the classes devoted to hams, bacon, and lard were of an attractive nature and added their quota to the educational nature of this great livestock fair.

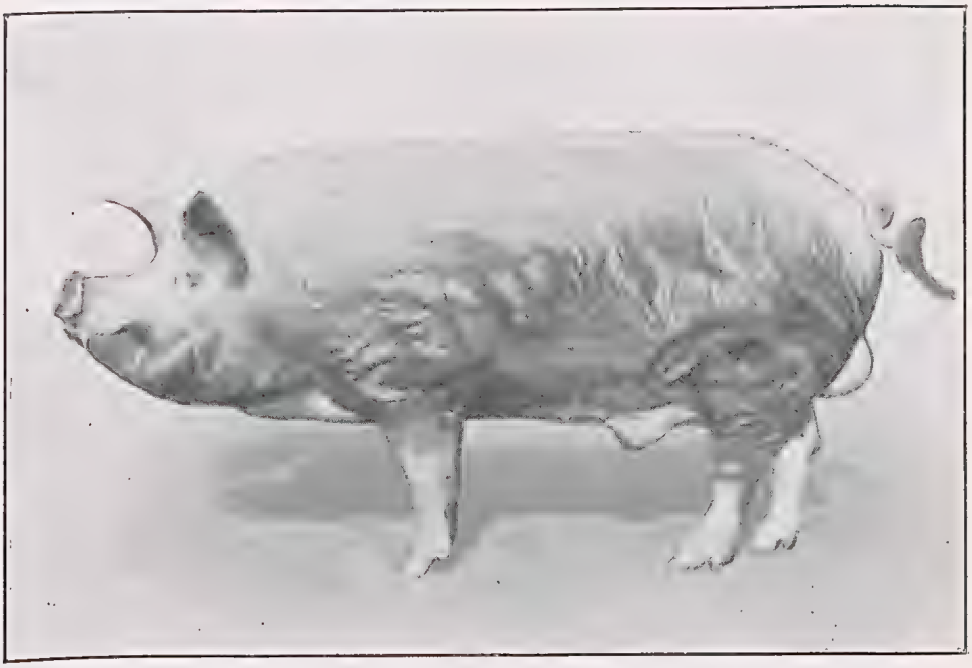


PLATE 88 (Fig. 1).

Champion Large Yorkshire Boar, Sydney Show, 1931. "Wall King David 14th" (imp.) 953. Exhibited by Elijah Charlish, of Camden, N.S.W. Note characteristic shape and type. This boar scaled over 700 lb. live weight, and was not overfat.

PLATE 89 (Fig. 2).

Champion Middle Yorkshire Boar, Sydney Show, 1931. "Norfolk Nobleman" 3993. A boar, the progeny of imported stock, whose type and quality was much admired. Note difference in type to the Large Yorkshire as shown in fig. 1. Exhibited by Elijah Charlish of Camden.

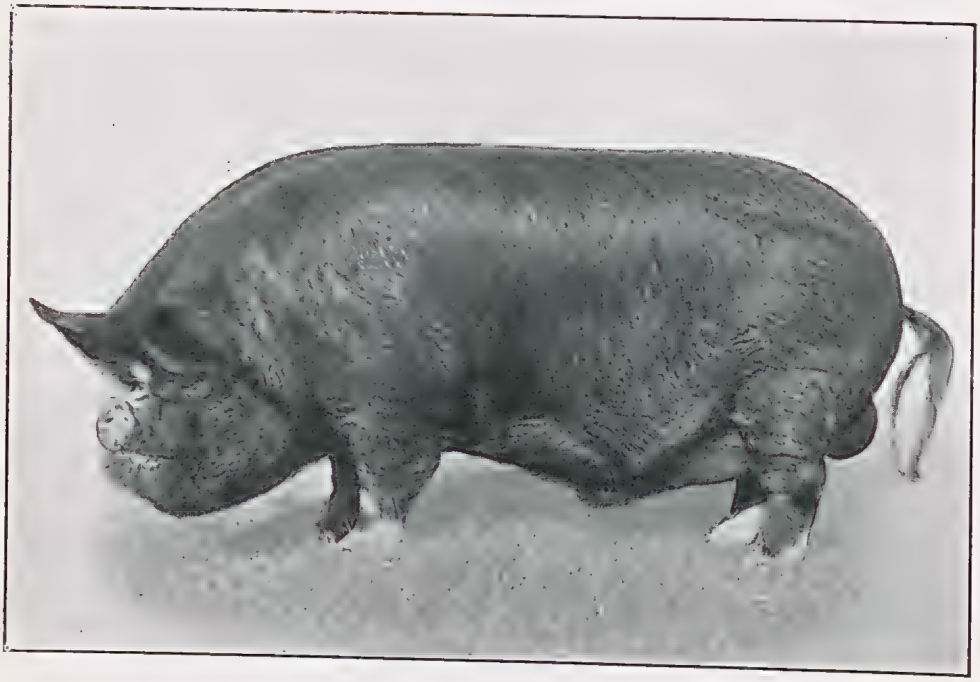


PLATE 90 (Fig. 3).

Champion Berkshire Boar, Sydney Show, 1931. "Wilmot Marquis" 9643. Exhibited by Navua Ltd., of Grose Wold, N.S.W. A boar whose breeding and quality is undoubted, and who comes from a long list of prize-winning stock.

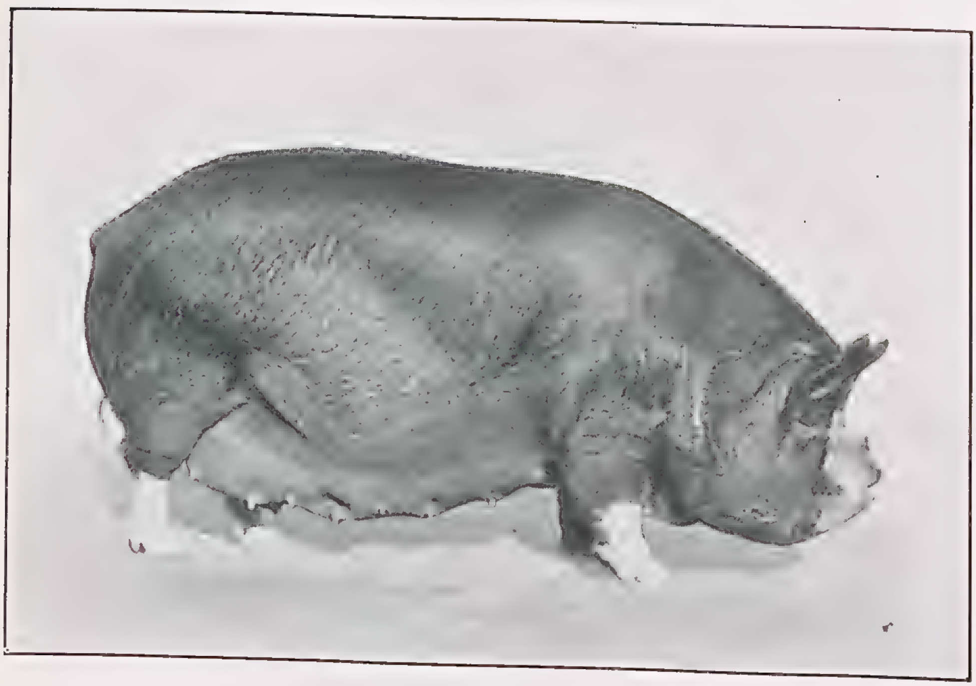


PLATE 91 (Fig. 4).

Champion Berkshire Sow, Sydney Show, 1931. "Danesboro Reconstructress" 9952. Also exhibited by Navua Ltd., whose success in the Berkshire section was a feature of the Show. This sow's breeding traces back on both sides to imported blood of a superior type.

PLATE 92.—MEMBERS OF THE FARM BOYS' CAMP AT THE ROYAL EASTER SHOW, SYDNEY, 1931.

The group includes ten Queensland lads, of whom six are seated in the front of the group; two of the Club organizers, Mr. T. Porter, of the Queensland Department of Public Instruction, and Mr. W. Blacklock, Assistant to Mr. E. Buckwell, who has charge of the Junior Farmers' Movement in New South Wales. The New South Wales boys were, with one or two exceptions, older than the Queensland lads. All spent a very happy and profitable time as guests of the Royal Agricultural Society of New South Wales.

POTATO MOTH.

By A. PERSON, Senior Inspector, Diseases in Plants Act.

FUMIGATION TEST.

On the 3rd January, 1931, a fumigation test was made by fumigating potatoes affected with potato moth larvæ. A charge of 3½ oz. of carbon bisulphide was placed in the Departmental Chamber of 210 cubic feet capacity, and the affected potatoes left in for forty-eight hours. On examination after fumigation the grubs were alive and appeared not to be affected in any way.

A second charge of 7 oz. was placed in the same chamber for the same period, and a fresh lot of infested tubers treated, and with fatal results. The larvæ on examination, although some distance in the tubers, were dead in every case examined, and had turned a brownish colour all over the body.

A further batch was again tested in the same chamber with 5 oz. of carbon bisulphide, and although the grubs were tunnelled some distance into the tubers, the results proved fatal to them.

A germination test was made with three of these tubers fumigated with 5 oz. of carbon bisulphide. They were set under wet bags on the 2nd February, and to-day had developed excellent shoots, proving that the carbon bisulphide had not affected the eyes for germination purposes.

PIGMENTATION OF MILK AND MILK PRODUCTS.

Milk contains two classes of pigments, the fat soluble and the water soluble. Among the former carotinoids only are found, and of these carotin predominates. This pigment (carotin) characterises the adipose tissue and skin secretion of dairy cattle, especially Jersey and Guernsey breeds.

There is a striking difference between the various breeds of dairy cattle with respect to the amount of carotin incorporated in the butter fat. Guernsey and Jersey rank first, with the Ayrshire, Shorthorn, Holstein, and other breeds lower in the scale.

These differences are relative, and sometimes when no carotin is present in the food the milk fat of all breeds becomes almost colourless. The colour of butter often persists longer on carotin-free feeds in the case of Guernsey and Jersey breeds. The fact that the adipose tissue of these breeds is also highly coloured with carotin has given rise to the idea of a storage of pigment to explain a greater persistence of pigmentation when no carotin is fed.

Pumpkins and squashes contain carotinoids, and when fed to hogs produce a good flavour in the meat which, however, may obtain an undesirable yellow colour.—CHAS. MCGRATH, Supervisor of Dairying.

JUGULAR VEIN INJECTIONS.

A SAFE AND CONVENIENT METHOD.

By F. R. THOMPSON, Stock Experiment Station, Yeerongpilly.

This simple method of injecting sterile solutions into the jugular vein devised and successfully employed by the writer in the treatment of bovines with trypan-blue and trypaflavin against tick fever is devoid of danger and is efficacious.

Appliances.

Glass separatory funnel fitted with glass stopper and glass tap, capacity 200 cc.; 10 inches of good rubber tubing to connect funnel to canula; tourniquet of strong cord about 4 feet by ¼ inch; trocar and canula for bleeding.

Sterilisation of Appliances.

Boil the solution to be injected for ten minutes in a suitable vessel, boil also the trocar and canula, rubber tubing, and separatory funnel. Pour solution into funnel, replacing stopper with cotton wool plug. Disinfect the tourniquet by immersing in disinfectant, viz., Hycol, Izal, &c.

Procedure.

Animal in standing position, crush, stall, or bail, and secure. Animal down, place full stretch on side, head back, neck resting on block of wood or brick. Thoroughly disinfect neck with suitable disinfectant solution. Place tourniquet in position round neck, take up tight and make secure with quick release knot; extra tension by twitching may be necessary. Insert trocar-canula into swollen vein (above the cord on head side) directed towards the body (the way the blood flows to the heart), secure good flow, withdraw trocar, connect canula to funnel with rubber tubing; open tap, allow blood to flow into and mix with solution in the funnel, thus repelling all air in tubing, funnel apparatus and contents to be in upright position; release tourniquet and the contents of the funnel will now run back into the vein. Finally withdraw canula and disinfect the neck.

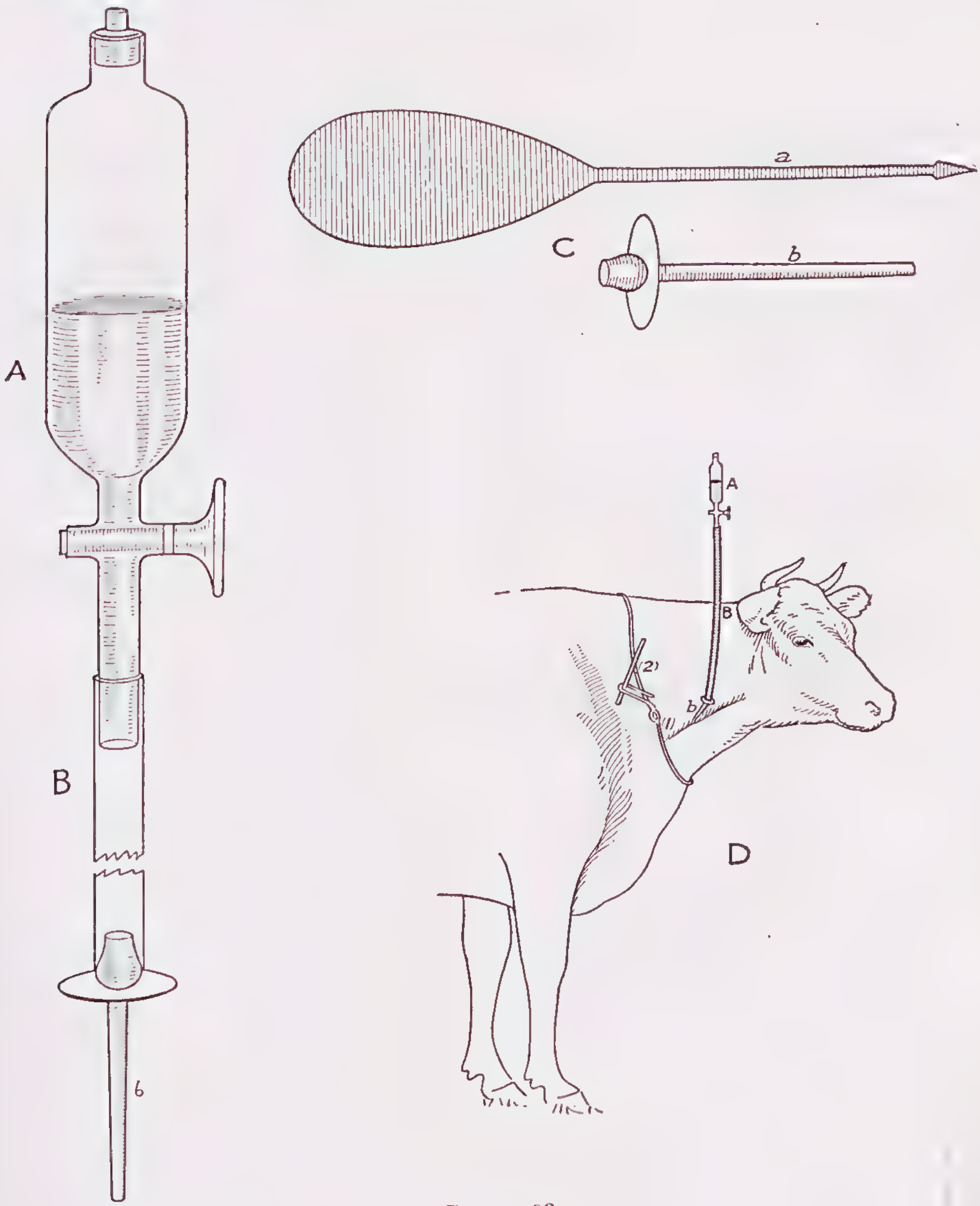


PLATE 93.

A. Separatory funnel.
B. Connecting rubber tubing.
C. Trocar (a), Canula (b).
D. Animal showing the apparatus in use—(1) Tourniquet, (2) twitch stick.

The Young Farmer.

HIGH GRADE MILK.

By CHAS. McGRATH, Supervisor of Dairying.

MILK is a natural human food containing in a readily digestible form all essential food elements, while milk products constitute an important part of the food of mankind.

Milk readily absorbs odours and flavours and is attacked by bacteria.

Through bacterial activity milk undergoes rapid changes which affect its quality and general character.

The milk in the udder of the cow in normal health is practically free from micro-organisms.

Under careful conditions pertaining to its production, it is impossible to keep milk entirely free from micro-organisms. Hygienic conditions pertaining to the production and handling of milk ensure a product having a low bacterial content, and possessing good keeping qualities.

It can be generally stated that the change in the bacterial content of milk during the first few hours after it is drawn from the udder of the cow is dependent upon the initial bacterial count. The initial bacterial count is directly influenced by—

(1) The health of the producing cow—i.e., that each cow is in normal health; that there is no mammary trouble, such as inflamatory condition of the udder—e.g., mammitis (mastitis).

(2) The condition pertaining to the production and handling of the milk. Efficiency in this section has an important bearing on the number and species of the bacteria introduced into the milk. The chief sources of infection being:—

- (*a*) The coat, udder, and teats of the cow;
- (*b*) The hands and clothes of the milker;
- (*c*) The dust from the air in the milking-shed and place where milk is treated.
- (*d*) The condition of the milking machine, dairy plant, and utensils that come in contact with the milk.

Attention must be given to—

- (*a*) The clipping off of all long hairs from the flanks and udder when the cow first flushed and the cleansing of the flanks, udder, and teats of the cow, the hands and apparel of the milkers and other operatives.
- (*b*) The cleansing and near sterilisation of the milking plant and the renewal of the rubber parts as required. The cleansing and near sterilisation of all dairy utnsils that th milk comes in contact with.
- (*c*) It should be borne in mind that the less milk is brought in contact with the apparatus the less the source of infection.
- (*d*) The milking shed and dairy buildings should be constructed on hygienic lines and kept in a condition to allow of the production of milk under sanitary conditions.

(3) Time elapsing from production to treatment or consumption of the milk.

The period for which milk will remain in a sweet, wholesome state is dependent upon the initial bacterial count, and the conditions under which it is held.

Temperature.

The temperature at which milk is held exercises a direct influence on its keeping quality.

Efficient cooling checks development and multiplication of the bacteria in the milk, but by higher temperatures certain undesirable types of bacteria gain the upper hand.

It is advisable where milk is to be despatched to a factory or milk plant or is intended for human consumption, that it be cooled as soon as possible after it is drawn from the cow to a temperature preferably below 40 deg. Fahr.

The cooling should be carried out in a clean, sanitary place and in pure air.

Straining.

Effective straining is secured by passing the milk through specially prepared cotton wool.

The straining is ineffective to improve the bacterial content of the milk. In its production, handling, and delivery, every precaution must be taken to prevent dust, and particles of dirt, with adhering bacteria, from gaining access to the milk. Methodical hygienic conditions are associated with the production of milk, with a low initial bacterial content, resulting in a high-grade product.

STOCK FOOD MEALS.

Meat Meal.

Meat meal is a packing house by-product, prepared from meat scrap generally (such as is not suitable for use in the preparation of small goods, sausages, &c.). This scrap meat is cooked under steam pressure until the fat is removed, after which the product is dessicated or ground up, dried, and sold under various trade names, including digestor tankage (an American term) and various grades of meat meal. When mixed with blood it is known as meat and blood meal, and when incorporated with ground bone is styled blood and bone meal. Most of the meat meals used in Australia carry from 50 to 60 per cent. crude protein, and as their content of ground bone is high, they carry a good mineral and a liberal fat content. This meat meal is a valuable addition to the list of foods available, though it must always be looked upon as a condiment more than as an actual food, for if pigs were fed entirely upon meat meal they would suffer severe internal disorders and make unsatisfactory growth. A common mixture would be, say, milk, maize, and meat meal; or maize and meat meal, if milk is not available.

It is the animal protein in meat meal that stimulates the appetite, builds up bone and muscle, and encourages a healthy, vigorous development, in addition to reducing the amount of grain (maize, &c.) necessary to produce pork. In some overseas experiments the addition of meat meal to the rations of pigs weighing 60 lb. reduced the corn allowance by 4 lb. per day, a substantial amount and one worth consideration.

As is the case with most of the protein foods, they are more valuable in the feeding of young pigs and of sows in pig than of mature stock, while it is also more valuable in the absence of skim milk, butter milk, or whey than where these by-products of the dairy are used. Similarly, if there is a liberal supply of green lucerne, field peas, or other nitrogenous foods, less meat meal will suffice.

Details of the analysis and price of typical samples of meat meal may be obtained on application to manufacturers or departmental experts at any time.

Blood Meal.

In general, in Australia, blood meal is not utilised as a stock food to the same extent as in America, for here it is usual to mix the blood with bone meal and sell it under the trade name of blood and bone meal, a well and favorably known garden fertilizer. Blood, of course, also enters into the composition of meat meal, while in the "make up" of a number of concentrated calf meals, dog biscuits, and other preparations for stock this product is utilised in limited quantities. It carries a very high protein content (as high as 80 per cent.), and is, of course, comparatively expensive.

As a direct food it is not advised, for apart from being unpalatable it is too rich and too highly concentrated, and would cause serious digestive disturbances if used as the principal item in any stock ration.

It has medicinal values and has been used with success in severe cases of bowel disorders. Some authorities even say that a few handfuls of blood meal fed to a suckling sow is usually effective in stopping scours in her litter, but, as indicated, even when used for this purpose care must be exercised, otherwise indigestion and gastric disorders will follow. It has a value in calf feeding if used judiciously. Ordinarily, of course, strictly limited amounts of boiled blood may be mixed in with other pig foods and be utilised, but this only applies to the small amounts that are occasionally available when a beast or a pig is killed for home consumption.

The excessive of any meat product in the feeding of pigs is not advised.

Fish Meal.

Though not usually available as a stock food on the Australian markets, fish meal is recognised overseas as a valuable addition to the list of concentrated foods available for farm stock. It is usually prepared by fish paste manufacturers and by packers of dried or tinned fish, and like meat meal, &c., has a place in all feeding systems. In some instances where fish oil is the principal product of manufacture the fish meal resulting from grinding of the residue from the oil factory carries a higher percentage of oil than is the case where fish scrap from small fish is used. A popular make of fish meal in America is known as Menhaden or fish meal, prepared from the by-products of herring packing works. There are two or three grades of fish meal, one known as white fish meal being preferred for pig or stock feeding; white fish meal carries more flesh and less fat than yellowish coloured meals. A point stressed is that fish meal is usually credited with having a liberal content of potassium iodide or iodine ; an addition of value for stock feeding purposes. It is claimed that the use of iodine rich foods results in stronger and more vigorous suckers being produced; and the sow's milk flow is strengthened in proportion to the allowance of iodine rich foods she receives.

In general, the use of fish meal is not advocated by pork butchers or bacon curers, but, of course, they object to an excess of any risky foods in the preparation of pigs for the bacon, pork, or frozen pork trade.

We have not had much experience in Australia in the use of fish meal as a stock food, largely because meat meal, protein meal, linseed oil meal, &c., have been given more prominence. Then, again, the fish business has not been developed in Australia to anything like the same extent as abroad. Fish meal must be looked upon with a certain amount of suspicion where it is recommended as a food for pigs.

CURING BACON AT HOME.

THE carcass of a pig, after hanging over night to cool, is laid on a strong bench or stool and the head is separated from the body at the neck close behind the ears. The feet and also the internal fat, kidneys, &c., are removed. The carcass is next divided into two sides in the following manner:—A deep cut is made with the knife the whole length of the back from tail to neck on either side of the backbone, which is removed by sawing the ribs from each side.

The pig thus cut up is ready for being salted in the following way:—

Dry Curing.

(1) Take fine salt 25 lb., brown sugar 2½ lb., saltpetre 1 lb. Mix well together. For the first three or four days the above mixture should be well rubbed in over the fleshy parts and around the bones and joints. Afterwards, spread the mixture freely each day. The sides should be stacked so that the sides on top one day will be at the bottom the following day, and leave for upwards of three weeks away from the flies.

If there is reason to doubt the keeping quality of the bacon, stick in a knitting needle to the bone (shoulder or ham), draw it out, and if an odour clings to it it will indicate whether the bacon is good or not.

Pickling.

(2) Take clean rainwater 10 gallons, fine dry salt 25 lb., brown sugar 2½ lb., saltpetre ½ lb., salt prunnella ¼ lb., allspice ½ lb. Dissolve the above ingredients in the water, then put in the allspice tied up in a bag. Boil for upwards of an hour and remove all scum as it rises to the top. Allow the solution to cool before use. The above quantity is sufficient for 200 lb. of meat.

The strength of pickle should be closely watched. Its density should be 90 to 95 on the salinometer.

Before immersing the sides in the pickle they should be rubbed with salt for a day or so. This will tend to purge the meat of all blood, &c.

After salting and pickling the flesh is brushed and then washed in rain water and soaked in a solution made by dissolving ½ lb. of bicarbonate of soda in 10 gallons of clean rain water. Again wash with clean rain water.

Twenty-one days should be sufficient time for pickling—hams require four to five weeks, according to size.

The next thing is drying. This should be done away from flies and dust in a moderately warm room. Care must be taken that the sides are evenly dried and firm all over.

Finally, remove to smokehouse and smoke to taste. Hang the sides shoulder up and finish by rubbing the skin over with olive oil.

THE CARE OF THE CAR.

CARBURETTER ADJUSTMENT

PETROL and air mixed are really the engine's food, and the carburetter, together with the intake manifold, is a combination cook oven and water, inasmuch as the petrol and air are correctly mixed in the carburetter, then warmed, and finally delivered to the correct cylinder. It is an unfortunate fact that most popular makes of carburetters differ considerably in their appearance and in the details of their adjustments. However, almost all carburetters are the same in principle, so that if the principle is described the reader should be able to check his own carburetter.

For satisfactory combustion the air and petrol must be very intimately mixed and at the same time the petrol must be vaporised before it is burned. The air and petrol are intimately mixed within the carburetter in much the same manner as air and liquid are mixed in the average fruit spray. Within the carburetter there is a restricted passage through which air is sucked by the engine. This restricted passage is known as the throat of the carburetter. In the throat of the carburetter the petrol jet or jets are situated. These jets are so arranged that the rushing of the air past the jet causes the petrol to be sucked out of them in the form of a very fine fog. The level of the petrol in the jets is maintained by the action of the float chamber, the float and needle valve of which ensure that the chamber is always filled to a definite level. This level is usually arranged so that it is about ⅛ inch below the level of the top of the jets. When a carburetter is found to lose petrol over the top of the jets while the engine is standing then the float chamber is adjusting the level incorrectly.

Between the carburetter and the manifold the throttle valve is placed. The throttle valve is usually a simple rotating disc within the round pipe, so arranged that it practically seals off the pipe when the accelerator is released and completely opens the pipe when the accelerator is fully depressed.

Usually a special idling jet is provided and this jet is so arranged that when the throttle is closed a small current of air passes it and conveys a comparatively rich mixture to the carburetter for idling purposes.

Many carburetters are fitted with an auxiliary air valve so arranged that as the engine is speeded up and the suction in the carburetter increased the auxiliary valve will open and allow more air into the carburetter. This is done because, as the suction becomes greater, the carburettor tends to feed too rich a mixture, which must be broken down by the addition of more air.

Most engines have a hot spot fixed on the pipe between the carburetter and the intake manifold. This hot spot is a jacket around the pipe which is usually located by exhaust gases, but sometimes by hot water from the cooling system. The purpose of this hot spot is to make sure that the petrol is actually vaporised. Liquid petrol will not burn. In cold weather it is possible to put out a burning match by throwing it into an open tin of petrol, as when the petrol is cold it does not give off inflammable vapour. When the petrol is drawn from the carburetter jets it is in the form of a very fine fog or mist. That is, air mixed with very small particles of liquid petrol just the same as fog is air mixed with very small particles of liquid—water—not water vapour, as water vapour is invisible. The small particles of liquid petrol must be converted into petrol vapour and the heating at the hot spot causes these particles to vapourise.

To get the maximum economy from the engines working the mixture supply must be correctly proportioned.

Rich Mixture.

Many motorists operate their cars with too rich a mixture because an over-rich mixture makes the engine more tractable at low speeds. For this reason rich mixture is known as "lazy-man's" mixture. Not only does rich mixture waste petrol, but it has a deleterious effect upon the engine, as the excess petrol dilutes the lubricating oil, causing the oil to lose its efficiency and thus promoting wear. Also rich mixture causes an excessive deposit of carbon in the engine, as all the carbon in the fuel cannot be burned when the air content of the mixture is inadequate.

The carburetter should first be adjusted by adjusting the idling screw to get the engine to idle slowly. Most carburetters have a mixture adjustment, although some carburetters have set jets and to make any adjustment the size of jet must be changed.

When a mixture adjustment is fitted the mixture should be weakened until the point is reached where the sudden opening of the throttle causes the engine to "cough" or "pop back" before it picks up speed. At this point the mixture is a little too weak and should be strengthened a little. The mixture is always too rich when any weakening of the mixture tends to make the engine speed increase. The final test of the carburetter adjustment is to run the car on the road and check the petrol consumption. The carburetter should never be adjusted while the engine is cold, as if that be done the mixture is sure to be too rich when the car warms up. The judicious use of the choke when warming the engine up will take care of the engine's tendency to stall.

The choke or strangler is a device on the carburetter to enable the driver to procure a rich mixture for starting purposes. This is effected either by opening up the adjustable jet, as is done in the Stewart carburetter, or by shutting out most of the air with a choke or strangler valve, as is done in most other carburetters. The choke should always be used with care when warming up a cold engine, as by its injudicious use it is possible to flood the engine with practically raw petrol. It is much better to have the engine stall rather than to feed it an excessively rich mixture. When a car is fitted with an extra air attachment, petrol may be saved by opening the extra air on every down grade when coasting is not resorted to.

Another not unusual cause of petrol wastage is the repeated acceleration movements caused by rough roads and the foot resting on the accelerator. The accelerator should have a strong spring so that it can be held in one position continuously when desired.

There is a new line of carburetters on the market which have a petrol pump operated by the sudden movement of the accelerator. The idea of this pump is to force extra petrol into the intake when the accelerator is suddenly jammed down. This device gives rapid acceleration, but if the accelerator is oscillated during ordinary driving will cause considerable waste.—"RADIATOR," in the "Farmer and Settler."

FERTILIZER TRIALS AT ELIMBAH.

By H. BARNES, Instructor in Fruit Culture, Brisbane.

PINEAPPLE PLOT.

Drainage.

The underground tile drain laid down last September has proved a complete success during the recent wet weather. During the exceptionally wet periods in February and March it was running at full pressure, and, with the exception of a day or two days during the fine weather about the beginning of March, there has been a continuous smaller flow since the commencement of the wet season.

It may be interesting to record here that the average output of a 3-inch drain is quoted as 3,600 gallons per hour, so that the benefits to be derived by plants growing in a badly drained soil may be readily reckoned when drains are used as a means of quickly reducing the water level in the soil.

The appearance of the plot has greatly improved since the wet weather, and, with the exception of rows Nos. 7 and 14, the plants generally have a good colour. Much of the long spindly growth mentioned in the last report as growing in some rows has disappeared, and stronger growth is evident. Plants from which fruit has been cut are throwing out good strong suckers.

The soil in rows 8 and 12 was subject to calcium cyanide treatment for nematodes prior to the setting out of the plants. For some time after planting the plants showed very poor results, but now, however, they are growing well and are much improved and bigger. This tends to the belief that calcium cyanide applied to soil has the effect of retarding growth somewhat in the first instance. Row No. 2—to which sulphate of ammonia only was applied—holds the premier position so far as general appearance and even growth are concerned. Row No. 7—to which sulphate of potash only was applied—is a poor colour though possessing strong plants. The fruit on Row No. 4—which received blood alone—is very backward, being at least three weeks behind most other rows.

The applications of the fertilizer mixtures set out in the following table were made in April and October, 1930:—

PLOT—FOURTEEN DOUBLE ROWS, 9 FT. (CENTRE TO CENTRE) APART, 50 YARDS IN LENGTH.

Row No.	Nauru Phos.	Sulp. Amm.	Sulp. Potash.	Blood.	Basic Super.	Bone.	Previous Remarks.	Present Condition.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.		
1	..	Check	Row	..	..	..	Fairly strong plants; pale colour; growth fair. Number of fruit, 119.	Growth and colour fair.
2	15	10	10	..	..	..	Good even growth; colour very good and best in plot. Plants somewhat small though growing well and showing benefit of change over from Nauru alone. Number of fruit, 21.	Best row on appearance; fairly strong plants; colour very good and growth very uniform.
*3	24	..	..	14	..	..	Sturdy plants; growth fair; pale foliage. Best row for fruit, 136.	Good strong row; colour improved.
4	..	..	..	20	..	..	Growth variable; some long narrow swordleaf growth; colour fair; Fruit, 79.	Growth variable and inclined to be soft. Fruit about three weeks behind other rows.
5	..	10	16	10	..	..	Growth very uneven; spindly narrow leaves; colour fair. Fruit, 52.	Much improved; strong growth and good colour.
*6	..	10	10	..	15	..	Paper mulched; growth improved; colour good, somewhat uneven growth. Fruit, 52.	Growth further improved; colour good.
7	..	..	20	..	..	..	Good strong even growth; foliage very pale. Fruit, 88.	Strong even row; foliage pale. Fruit inclined to be rather smaller in size.
8	..	..	18	18	..	..	Fair growth; some spindly plants; colour generally good, though variable condition of plants. Fruit, 77.	Growth and colour improved; new growth inclined to be soft; average fruit larger than other rows.
†9	16	..	18	14	..	..	Sturdy plants and good growth; colour fair. Fruit, 116.	Good growth though variable; colour fair.
10	..	..	20	18	10	..	Growth variable; fair to good; long narrow swordleaf foliage. Fruit, 74.	Growth fair to good; colour variable.
11	..	18	20	..	10	..	Colour slightly better than 10, and growth similar. Fruit, 49.	Growth improved; colour fair to good.
*12	..	..	20	16	..	14	Fairly strong growth; colour good; growth uneven. Fruit, 74.	Growth improved; colour good. Fruit early and of good size.
13	..	‡10	†30 ‡10	..	..	..	Weak growth; colour good. Fruit, 77.	Growth improving; colour good.
14	..	Check	Row	..	..	..	Poor. Fruit, 40.	Poor.

* Paper Mulched. † Applied in April. ‡ Applied in October.

THE EFFICENCY OF THE AUSTRALIAN WORKER.

Mr. S. McKay, chairman of directions, H. V. McKay Pty. Ltd., Sunshine, Victoria, on his return from a trip overseas, said: ''Other countries have their worries, but they do not proclaim them to the world as we do. Australia is certainly passing through a very difficult period, but she can make a good recovery. She has wonderful powers of recuperation. She has been suffering from dry conditions and general depression, but so have other countries. The experience in Australia, however, has shown that good seasons invariably follow bad. Australia possesses the right quality of materials, her steel, leather, and timber, particularly if the last-named be properly seasoned, more than meet the requirements for the manufacture of harvesters, as far as quality is concerned. Australian workmen are efficient, skilful, and hardworking, notwithstanding what some people have said to the contrary. There is no finer workman than the Australian, and, moreover, he possesses initiative. I would not change my staff at Sunshine for any staff that I have seen in America.''

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Tick Trefoil.

R. W. R. (Byrnestown)—

The specimen of clover-like plant you send is a species of Tick Trefoil or Desmodium, and we should say is *Desmodium triflorum,* though your specimen bears neither flowers nor fruits. This plant is a very useful one in the pasture, but grows close to the ground. Seed is not stocked by nurserymen, but once you have the plant growing on your property we should say it would be spread naturally by stock.

Noogoora Burr.

W. M. B. (Toowoomba)—

Noogoora Burr is looked upon as poisonous only in the very young stages—that is, just after the seeds have germinated. The older plants are regarded as being quite harmless. However, if chaffed or cut up there is always the danger of the burrs causing mechanical injury.

Northern Shade Trees.

J. J. C. (Feluga, N.Q.)—.

A good tree for your purpose would be the Phytolacca or Bella Sombra Tree (*Phytolacca dioica*). We do not know that this is usually stocked by nurserymen, but seeds could be obtained from Mr. R. Dick, Purga, via Ipswich, at 2s. per large packet. The tree has the advantage that it is an exceptionally rapid grower and that stock are quite fond of the leaves. Other trees that should also do well with you and are worth planting for shade purposes are Weeping Fig, Rain Tree (*Pithecolobium samen*), Terminalia, and Calophyllum. All these should be obtainable from the Botanic Gardens, Townsville, or from Mr. Gulliver, nurseryman, Hyde Park, Townsville. If not in stock by them, then we think you could certainly get plants from the Curator, Botanic Gardens, Rockhampton. The common mango is a tree not to be despised as a shade and ornamental tree. If you intend to grow it, we think you will find it advisable to plant the seeds in the place intended for their permanent site.

Prickly Poppy. Thorn Apple. Variegated Thistle.

J. H. McC. (Dalby)—

1. *Argemone mexicana.* Prickly Poppy. This plant is generally regarded as being poisonous to stock, though practically always neglected by them. The only cases that have actually come under our notice have been where the plants have been cut and allowed to wilt and stock have subsequently eaten the cut, wilted, and naturally softened plants.

2. *Datura ferox.*—A species of Thorn Apple or "Stranunium." This plant is one of the most poisonous we possess, but, generally speaking, is avoided by stock, the only cases that have come under our notice of poisoning by Daturas in Queensland being where the plants have been growing in cultivation and have been chaffed up with the crop, particularly lucerne.

3. *Silybum Marianum.* The Variegated Thistle. Stock eat large quantities of this plant without any ill-effects following, but it is supposed at times to develop a prussic acid yielding glucoside, when, of course, it would be poisonous. So far as we know, however, the presence of the glucoside has not been proved, and the specimens you send were altogether too decomposed to hand over to the Agricultural Chemist for the purpose of chemical analysis.

Cassia Fistula.

N. G. B. (Toogoolawah)—

From leaf only we should say the plant is *Cassia fistula*, the Golden Shower or Indian Laburnum, largely planted in coastal Queensland as an ornamental tree. We should imagine, however, that conditions at Toogoolawah are rather cold for it. It is essentially a tropical tree and grows very well in the neighbourhood of Cairns, producing there long pods known as Cascara Beans. These, however, are not the source of the Cascara of commerce, which comes from the bark of a North American tree. The plant is a species of senna, and the pulp surrounding the seeds is largely used in North Queensland as a mild and safe purgative.

Noogoora and Bathurst Burrs.

C. (Toowong)—

Noogoora Burr is botanically *Xanthium pungens*, and is supposed to have first made its appearance in Queensland at Noogoora Station, Queensland, hence the local name. It is supposed to have arrived with cotton seed from America in the early 'sixties of last century. By 1879 it was recorded that 500 acres of Noogoora Station were overrun with the pest. From this beginning the plant has spread, practically speaking, throughout the whole of the State, except, perhaps, the very far west, mainly along rivers and alluvial flats.

The Bathurst Burr is *Xanthium spinosum*. It owes its common name to its having been first brought prominently to notice at Bathurst in New South Wales. Mr. J. H. Maiden, late Government Botanist of New South Wales, writing on the plant, said that it was originally introduced into South Wales, he thought, first at Twofold Bay in the tails of horses from Valparaiso, Chili, South America, in the 'forties of the last century. He further states that at Bathurst it was first noticed not many years afterwards on the site of the Old Black Bull Inn, corner of Bentinck and Howick streets.

Honey Locust.

T. L. (Brisbane)—

The thorny tree of which you left a specimen is *Gleditschia triacanthus*; the Honey Locust of North America. It is a handsome tree; the strap-like pods contain a sweetish pulp, and are freely eaten by stock. The tree is planted a good deal on the Darling Downs. We had one tree in the Botanic Gardens some years ago, but it died out owing to borer attack, to which the tree is rather subject.

Monkey Pod.

C. (New Farm)—

The botanical name is *Pithecolobium grandiflorum* and the tree is a native of the scrubs of coastal Queensland and northern New South Wales. It is well worthy of cultivation, being handsome either in flower or pods. The name Pithecolobium comes from two Greek words signifying Monkey and Ear-ring, due to the peculiar coiled, ring-like character of the pods before they open. The species are commonly known as Monkey Pod.

Orange Splitting.

"Pensioner" (Charters Towers)—

The Director of Fruit Culture, Mr. Geo. Williams, advises as follows:—The variety of the orange tree cannot be determined from your description, but would be included in the following:—Navel, Oonshii, or Mediterranean Sweet—most likely the latter. The splitting of the fruit is not confined to one variety. It is largely due to fluctuations of temperature and rainfall. An even supply of moisture throughout the growing season is most desirable. Usually splitting of the fruit is much less pronounced in aged than in young trees.

General Notes.

Correction.

There was an obvious error, due to the misreading of a shorthand note, in the legend under Plate 74, "A Farmer's Flock in New Zealand," on page 238 of the April issue (Part IV., vol. xxxv.) of the Journal. In the second line the word "lamb" should be substituted for "ram," on the third line "lamb" should also be substituted for "sire" and the words "fat lamb" before the last word "trade" should be omitted. The corrected legend should read:—The male progeny of this fine mob of Southdown ewes will be mated with long-wool ewes (mostly Romney Marsh). The ultimate resultant lamb from this cross is considered, in parts of New Zealand, to be the right type of lamb for the trade.

Water Hyacinth and Yams as Food for Pigs.

A reader living in the far north of Queensland writes that he finds his breeding sows and other pigs like the water hyacinth plants. He has used it for breeding sows and they do fairly well on it along with other feed; in fact, during a spell of short supply of other foods the pigs got practically nothing else. It was fed raw, and they ate the tops, leaves, roots and all. They also eat the stalks and roots of the flat-leafed water lily which they appear to relish.

Another plant called the Bulgaroo grows very well in the swamps of the North, as also yams of which there are many varieties. Specimens of yams on view recently were about three times the size of a well grown sweet potato. Thousands of wild pigs live and do well on these foods on many of the swampy islands and swampy areas along the coast of Queensland and in the swamps in the western areas.

Atherton Tableland Maize Board.

Following are the results of the recent election of five growers' representatives on the Atherton Tableland Maize Board:—

William Bailey (Atherton)	185 votes.
Edward Hall (Tolga)	177 "
John Francis Quilter (Tolga)	170 "
Robert Hill (Atherton)	167 "
Thomas William Bray (Yungaburra)	163 "
John Gargan (Atherton)	153 "

The successful candidates will be appointed for a term of one year as from the 1st April.

In pursuance of the provisions of "*The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1930," Mr. William Bailey has been appointed Chairman of the Atherton Tableland Maize Board from 1st April, 1931, to 31st March, 1932.

Powers of Cane Pests Boards.

A regulation has been issued under the Sugar Experiment Stations Acts empowering Cane Pests Boards to deal effectively with pests on private lands. It provides that a Board may serve a notice upon the occupier or owner of any infested land in its area requiring him to take within a certain time specified measures for the eradication of the cane pests on his land. If he fails to comply with such notice in the stated time he shall be liable to a penalty of £20, and any member or agent of the Board may, with such servants and assistants as thought desirable, enter upon the land and take the measures defined in the notice served upon the owner. Any expenses incurred by the Board in doing this may be recovered from the owner or occupier in any court of competent jurisdiction.

Lactating Dairy Cattle Need Plenty of Water.

The water consumption of ten lactating cows was measured by means of meters on the individual drinking cups over a period of four months. The water meters were read daily. The cows produced an average of 44 lb. of milk daily and drank on the average 16⅝ gallons of water.

On this basis each cow drank 3.4 lb. of water for each pound of milk produced.

As the average daily temperature increased, the consumption of water increased and vice versa.—Extract from Michigan Sta. Quart. Bulletin 1930.

Barley Board.

Messrs. Henry Kessler (Cambooya), Edward Fitzgerald (Felton East), and E. Graham (Director of Marketing), have been appointed members of the Barley Board as from the 24th April, 1931, to the 23rd April, 1932.

Honey Board.

The election of four growers' representatives on the Honey Board for a period of two years as from the 16th April, resulted as follows:—

	Votes.
Roy John Bestmann, Caboolture	218*
Charles William Edwards, Greenbank, via Kingston	212*
Alexander Roy Brown, Park Ridge	206*
George Herbert Whiting, Coowoonga	187*
Robert Victor Woodrow, Woodford	115
Henry Edgar Fagg, South Killarney	107
Owen Norman Tanner, Samford	105
John Schutt, Perthton, via Dalby	72
Frederick William Bentick, Stanthorpe	62

* Elected.

Arrowroot Board.

The referendum to decide whether arrowroot flour should be placed under the control of the Arrowroot Board resulted as follows:—

For	93 votes.
Against	35 votes.

The election of five growers' representatives on the Arrowroot Board resulted as follows:—

	Votes.
James Francis Cassidy, Woongoolba	70
Carl Brumm, Woongoolba	69
Gottlieb Christian Sempf, Norwell	67
Alexander Rose, Norwell	66
Robert Stewart, Ormeau	64
Benjamin George Peachey, Ormeau	61
Johann Friedrich Wilhelm Sultmann, Woongoolba	58
Leslie Roberts Oxenford, Oxenford	56
Morrison Clark, Pimpama	52
Ernst Traugott Zipf, Woongoolba	50
Hermann Wilhelm Koppen, Woongoolba	46
Peter Skopp, Woongoolba	25
George Rawlinson Walker, Upper Coomera	25

Messrs. Cassidy, Brumm, Sempf, Rose, and Stewart are therefore eligible for appointment for a term of three years as from the 15th April, 1931.

Extending Citrus Levy Regulations.

A regulation has been issued under the Fruit Marketing Organisation Acts making provision for the extension for a further twelve months of the Citrus Levy Regulations.

These regulations are similar to the previous ones, with the exception of an alteration in the amount of levy on the bushel cases, this being altered from 1½d. to 1¼d. per case, and will operate in respect of citrus fruits marketed for the period as from 1st March, 1931, to 28th February, 1932.

The levy shall be payable by the growers of citrus fruit at the rate of 1¼d. per bushel case and ⅝d. per half-bushel case, and 5s. a ton shall be payable on all citrus sent to fruit canners, fruit preservers, jam or pulp manufacturers, or juice extractors. The levy shall be collected by levy stamps obtainable from the Head Office of the Committee of Direction, Brisbane, and which are affixed to account sales, &c. This entitles the agent to deduct the value of the levy from moneys held to the credit of the growers concerned.

The levy will be expended in the interests of the citrus fruit growing industry of Queensland and in advertising in the interests of the growers.

Butter Board.

The Governor in Council has approved of the issue of an Order in Council giving notice of intention to extend the operations of the Queensland Butter Board from 1st July, 1931, to 30th June, 1934.

Any petition for a poll to decide whether the operations of the pool shall be continued must be signed by at least 10 per cent. of the suppliers of cream to the butter factories mentioned below, and also the butter factories themselves. The petition must reach the Minister not later than 5 p.m. on the 18th May, 1931.

Nominations are also called for election for three years as growers' representatives on the Board.

The Board shall consist of six elected representatives of the growers and the Director of Marketing, and will hold office from the 1st July, 1931, to the 30th June, 1934.

Each of the undermentioned Divisions of the State shall elect one representative:—

Division No. 1 comprising the Butter Factories at Malanda (2), Julatten, Daintree, Ravenshoe, Millaa Millaa, and Silkwood.

Division No. 2 comprising the Butter Factories at Bundaberg, Wowan, Rockhampton (2), Gladstone, Monto, and Mackay.

Division No. 3 comprising the Butter Factories at Gayndah, Biggenden, Kingaroy, Maryborough, Wondai, Nanango, and Murgon.

Division No. 4 comprising the Butter Factories at Chinchilla, Clifton, Dalby, Miles, Toowoomba, Crow's Nest, Goombungee, Oakey, and Roma.

Division No. 5 comprising the Butter Factories at Esk, Killarney, North Ipswich, Ipswich, Gatton, Booval, Boonah, Grantham, Laidley, Allora, Goondiwindi, Mill Hill, and Texas.

Division No. 6 comprising the Butter Factories at Caboolture, Pomona, Eumundi, Dayboro', Kin Kin, Beaudesert, Maleny, Kingston, Woodford, Cooroy, and Gympie.

Nominations will be received by the Under Secretary, Department of Agriculture and Stock, Brisbane, until 5 p.m. on the 18th May, 1931, for election as growers' representatives. Each nomination must be signed by at least ten cream suppliers in the Division concerned.

In order to ensure their names being on the roll of persons eligible to vote on any matters in connection with the proposed Board, cream suppliers to factories mentioned are invited to send their names and addresses to Mr. A. H. Jones, Returning Officer, Department of Agriculture and Stock, Brisbane. Full particulars will be found in the "Government Gazette" of the 18th April, 1931.

Codling Moth Control.

William Cooper and Nephews (Australia) Limited write, under date 5th January, 1931:—

In the October number of the "Queensland Agricultural Journal," on page 454, under the heading "Codling Moth Control," you publish an article relating to tests carried out by the Horticultural Division of the Victorian Department of Agriculture, in which you refer at some length to "Volck" and the results obtained with that particular product.

May we draw your attention to the fact that this article is merely an extract from the official report, and refers to only one of the products used. Several other oils and arsenates were also used in these tests, amongst them being "Alboleum" and "Arsinette," which are manufactured in Australia, and we enclose copy of that portion of the report dealing with the tests with "Alboleum."

You will notice that only five sprays were necessary with this Australian product as against six with most of the others, and that the results in this case were 98.8 per cent. of clean fruit, which figure was not exceeded by any other spray or combination of sprays. You will also notice that no spreader was used with this combination, which was apparently necessary in the case of the imported article.

We merely wish to draw your attention to this matter as we feel sure that you would like, if it is possible, to give some prominence to an Australian made article which has been proved to be equally as effective as the imported, and, as stated before, we refer you to the July issue of the "Victorian Agricultural Journal," which gives a full report of all these sprayings.

Staff Changes and Appointments.

The appointments of Messrs. J. C. Wilson (Wamuran) and B. Funnell (Dayboro') as Agents under the Banana Industry Protection Act have been confirmed as from 11th September, 1930.

Mr. J. H. Gregory, Instructor in Fruit Packing, has been appointed also an Inspector under the Diseases in Plants Acts.

Mr. L. M. Hodge, Manager, Cotton Research Station, Biloela, has been appointed also an Inspector of Stock.

Mr. F. A. L. Jardine, Inspector, Diseases in Plants Act, Stanthorpe, has been appointed also an Inspector of Stock in the same district.

The Officers in Charge of Police at Kingaroy and Wondai have been appointed inspectors under the Brands Act as from the 18th April, 1931.

Mr. H. A. McDonald, Inspector of Stock, Kingaroy, has been appointed also an Inspector under the Slaughtering and Brands Acts, as from the 18th April, 1931.

Mr. Simmonds's Oversea Tour.

The Minister for Agriculture and Stock (Mr. Harry F. Walker) announced recently that Mr. J. H. Simmonds, of the staff of the Division of Entomology and Plant Pathology, had been granted leave of absence to enable him to visit important plant pathological stations in America, Europe, and Asia. In the course of his overseas mission Mr. Simmonds will have opportunities of investigating certain diseases which are identical with or closely allied to serious local sources of loss to rural industries in Queensland. He will, for instance, break his journey in Hawaii, and while there will devote practically the whole of his time to a study of pineapple diseases. In California he will have an excellent opportunity of discussing the latest developments in citrus diseases, and the same will apply with respect to pathological problems of cotton in the Southern United States. Attention will also be devoted to maize problems further north. In England further opportunities will be available for the discussion of pathological problems with some of the world's leading plant pathologists. On his return Mr. Simmonds will break his journey in Ceylon, the Federated Malay States, and Java, where attention will be devoted to the diseases of the various tropical crops produced in these countries.

Mr. Simmonds will be absent from Australia for a period of ten months, and the Minister feels sure that agriculturists will be interested to know that, although Mr. Simmonds is on a private trip, many of their pathological problems will be securing the benefit of discussion with prominent overseas scientists.

Crutching of Sheep.

Crutching usually takes place about midway between shearings, and is therefore considered to be of some value as a preventive of blowfly infestation, as the fly does not operate so freely when the wool is short. With ewes in lamb crutching is usually performed about six weeks before lambing, the object being to clear away all wool from the hindquarters and over the udder, so that at lambing time there will be less attraction for the blowfly, and in order to make it easier for the young lamb when suckling its mother.

Maiden ewes and ewe weaners also require careful crutching, and the whole ewe portion of the flock is usually crutched at the one time. The crutching of ewes should extend well above the tail, taking in all the inner britch and, as stated above, in the case of lambing ewes, the area close to the udder.

Unless the fly is particularly bad, writes the Sheep and Wool Expert of the New South Wales Department of Agriculture, the only time it is necessary to crutch the wethers is when, owing to change of feed or other causes, they become scoured, in which case the soiled wool should be removed. When crutching wethers, therefore, only the wool immediately below the tail will be removed apart from the usual "ringing."

All sheep which are heavily woolled on the head should at this time be wigged. If this is neglected, such sheep cannot easily see their way about and may injure themselves against timber or fences. There is greater danger also of grass-seed entering the eye when a sheep is very woolly on the face.

Some sheepowners do not consider crutching necessary, but because of the cleaner appearance of the sheep and the absence of trouble with daggy wool at shearing, the operation is recommended, even though the fly may not be active.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

MORE ABOUT MILK.

THERE are many ways of giving milk to children. One of the best is to drink plain milk out of a cup. Sometimes children take it more readily if slightly sweetened or flavoured with a little cocoa or postum. Others prefer junket, or milk jelly or custard or milky puddings. Do not make these too sweet. Give them with stewed fruit. If this is not available, a spoonful of jam is a great help. Of course, milk will be taken with porridge or breakfast food. Bread and milk is wholesome, if children prefer their milk this way. If all mothers would take these wholesome milk foods, their children would be asking for them. A good example is better than much persuasion. The want of milk in a child's diet is more serious than most diseases. We may recover from disease; from want of milk during childhood we never recover.

Sour Milk.

There are two sorts of sour milk—bad sour milk and good sour milk. Bad sour milk is the ordinary sort produced by the growth of all sorts of bacteria. It is nasty and unwholesome. To make good sour milk you must procure a "starter" either from a butter factory or a laboratory. Scald your milk to kill nearly all its contained bacteria, let it cool to blood heat, add the "starter," and it will go nicely sour in twelve to twenty-four hours according to the temperature. In winter you may have to keep the milk warm. When it is sufficiently sour, you can stop the process by heating it. You need the "starter" only once. A teaspoonful of your own sour milk will start next day's milk.

Children at first do not like good sour milk, but if persuaded to take it they become very fond of it within a few days. It has the flavour of fresh cream cheese. A little sugar helps.

Some of the most vigorous and hardy races of men live largely or even chiefly on sour milk. It is a misfortune that we have forgotten how good and nice and wholesome it is.

Dried Milk.

Of late years we have had dried milks of much better quality than formerly. They are the best substitutes for good fresh milk when this is unprocurable, and as substitutes they have been very valuable.

Dried Skimmed Milk.

From this all the cream has been removed. It has, therefore, to be marked "unfit for infants." Although not a complete food, it contains all the constituents of milk except the butter, and being cheap should be a valuable substitute for fresh milk in our Western districts. It is not recommended for babies, but for children over two, for it makes very nice milk puddings. Always add butter in making puddings with dried skimmed milk.

Condensed Milk.

This is milk partly evaporated and preserved by the addition of a large quantity of sugar. About half of it is sugar, partly milk-sugar, but mostly cane sugar. For this reason it is a very poor substitute for fresh milk.

Butter.

This is the fat of milk and contains the vitamins A and D. It is a wholesome, valuable, and concentrated food. Children take it readily, and it is easy to give them too much. They then lose their appetites, probably also their tempers, pass putty coloured motions, and lose weight.

Cheese.

This is the valuable proteid of milk together with some of the fat. When given to children it should always be grated, and then makes delicious meals cooked with rice, macaroni, or cauliflower. Do not give too much.

TOMATO SEED SELECTION.

In selecting tomatoes from which seed is to be saved, only that from the best yielding plants which conform strictly to the characteristics of the variety, both as regards type of vine and type of fruit, should be chosen. Several fruit should be cut open to be sure of the quality. A plant should be chosen that produces a large number of average size tomatoes rather than a plant with two or three large fruits and a number of small ones. Care should be taken to see that the plant is free from disease, as several tomato diseases are transmitted by the seeds.

The best method of separating tomato seed from the surrounding pulp is as follows:—Cut the fruit in halves and scoop the contents into a bucket, and when the latter is about half full, fill up with water. Stand the bucket aside and allow the contents to ferment, which will take from two to six days, according to the warmth of the weather. A froth forms on top of the water when fermentation is sufficiently advanced. Wash the contents of the bucket on a fine sieve or a layer of hessian and the pulp will come right away from the seed, which must be spread out in a thin layer to dry. Rapid drying is important to prevent moulding. When dry, rub the seed in the hands to separate the individual seeds. Seed harvested in this manner has averaged 94 per cent. germination.

As already indicated, selection from a plant which is free from disease is important, but as a further precaution the seeds should be dipped for ten minutes in a solution of mercuric chloride, 1 part in 1,000 parts of water, before planting. Proper precautions must be taken with mercuric chloride where there are children or animals, as it is highly poisonous if taken internally.

THE FARM VEGETABLE GARDEN.

The question of drainage should be considered in relation to all classes of soil, but especially in relation to those that are at all heavy. Neglect to make the necessary provision on such soils explains many failures to get good results from them during the winter months. Now is the time to think of the question of treatment.

Briefly, the objects of drainage are (1) to enable as much water as possible to percolate through the soil, and (2) to prevent the lodgment and stagnation of water on the soil surface by enabling excess quantities of water to be carried away with ease. It is especially necessary, of course, to drain clay soils. If water is allowed to remain on these for long they tend to "puddle," but if the water is drained away the soil does not become so compacted, retaining, instead, a more friable (crumbly) and porous condition.

Drainage may be of two kinds—surface or underground; the latter is the more effective, but it entails more labour and expense. A simple surface drainage scheme consists of shallow trenches running between plot and pathway, and connected up to an outlet at a suitable point. A modified form of surface drainage is expressed in a system of raised beds. Where some form of drainage is necessary, and the installation of the underground system is impossible, either of these methods is to be commended.

Underground drainage necessitates a considerable amount of trench digging. On what plan it is advisable to set out the drains will depend upon the size and contour of the area. In some cases a herring-bone design may be applicable, the main trench forming the backbone, so to speak, and running through the lowest portion of the land and the smaller contributory trenches spreading upward from this. In other cases it may only be necessary to feed the main trench from one side, while in others again main trenches may best be laid at the edges of the area and fed from the centre. These trenches may then be partially filled with

broken stones, and the surface of the filling protected with a layer of tin or brushwood, so that the earth with which it is subsequently overlaid may not drop through and destroy the porous character of the filling.

A drain provided with this rubble filling is usually the most convenient to make, and is quite effective; but a roughly-built conduit or channel may take the place of the broken stones if desired. This may be made of flat stones or bricks, or (failing either of these) of boards. Only the sides and top need be formed of these materials, the trench floor serving for the bottom. The stones or bricks, or whatever is used, should only be loosely laid together, so that water may fall into the trench through them and be carried off. In country gardens, where saplings are easily available, these may be used effectively in the bottom of the trench (say a foot deep), covered by a 6-inch layer of brushwood.

The depth at which the drain should lie will depend upon the class of soil, but, needless to say, it should be sufficiently deep to allow of cultivation above it. If there is difficulty in arranging this the scheme should be so adjusted that the drain runs underneath the garden pathways, and not under the beds proper; 2 ft. 6 in. to 3 ft. is usually a satisfactory depth at which to lay a drain in the ordinary household plot.

There is little necessity for drainage on sandy soils, but gardeners working on land of a heavier character should set to work now to repair any deficiency in this direction. If the contour of the plot is regular it is not necessary to do the work all at once. As a section of the plot becomes vacant opportunity may be taken to carry out drainage work on it prior to preparing it for another planting. Then, when each section of the garden has been dealt with, the scheme can be connected up.—A. and P. Notes, N.S.W. Department of Agriculture.

KITCHEN GARDEN.

Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.

No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist springtime to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lots, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground. Many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock,

larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds. Mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors, plant bulbs such as anemones, ranunculus, fresias, snowflakes, ixias, watsonias, iris, narcissus, daffodil, &c. The Queensland climate is not suitable for tulips.

To grow these plants successfully it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should be raked over smoothly so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave the plants (if in the border) at least 4 to 6 inches apart.

A REMINDER TO ONION GROWERS.

Onion seed growers should, by this, have gone through their selected onions with the object of picking out the best keepers for the production of seed. The bulk of these onions should have been selected, previous to storing, for early maturity and variety characteristics. At the final selection bulbs that are soft or prematurely shooting, or those showing any indication of being bad keepers, or that are diseased, should be discarded.

The bulbs should be planted in rows at least 3 feet apart and spaced 2 feet apart in the rows. A handy position well protected from the boisterous winter winds should be selected for the growing of onion seed.

Farm Notes for June.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for ''pickling'' wheat by copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus address labels.

Orchard Notes for June.

THE COASTAL DISTRICTS.

The remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly puncture, as there is always a percentage of damaged fruit which is liable to speck, which must be picked out from all consignments before they are sent to the Southern States if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry the tree should then be given a good watering, and when the water has soaked in the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas, during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bonedust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year, consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact, there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and, unless there is a regular and abundant rainfall, they should be watered regularly. In fact, in normal seasons an adequate supply of water is essential, as the plants soon suffer from dry weather or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt area, which are nothing more or less than breeding-grounds for pests, such as fruit fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now, where the land is ready and the trees are to hand, as early planted trees become well established before spring, and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt, and the vineyard ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress, otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as, if allowed to remain longer on the tree, they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

SOLIDS IN MILK.

Total solids in milk increase as the lactation period advances and a material increase takes place towards the end of the period coincident with a decrease in the quantity of milk produced.

Milk fat + casein = 50 per cent. of the total solids of the milk.

Fat + casein + lactose (milk sugar) = 88 to 90 per cent. of the total solids of milk.

Since the fat and casein increases as the lactation period advances and the milk sugar remains constant, it is only to be expected that the total solids of milk would increase as the lactation period advances.

The total solids in milk are influenced (in addition to the period of lactation) by other factors, such as the individuality, the age, breed, health, and treatment of the cow and intervals between successive milkings.

The food supply and seasonal changes influence the amount of total solids in milk to the greatest extent.

Where cows are dependent on pasture lands for their food the weather conditions have an important influence on the total solids in milk.

In a favourable season when the cows have a plentiful supply of green succulent feed the total solids in the milk increase, while during a dry period when green succulent feed is not available for the dairy herd the total solids of the milk produced decrease.—CHAS. MCGRATH, Supervisor of Dairying.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	May, 1931.		June, 1931.		MOONRISE. May, 1931.	MOONRISE. June, 1931.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	6.21	5.17	6.39	5.0	p.m. 4.33	p.m. 5.25
2	6.22	5.16	6 39	5.0	5.11	6.23
3	6.23	5.16	6.40	.5.0	5.47	7.22
4	6 23	5.15	6 40	5 0	6.43	8.21
5	6.24	5.15	6.40	5.0	7.40	9.19
6	6.24	5.14	6.41	4 59	8.38	10.17
7	6 25	5.13	6.42	4.59	9 37	11.11
8	6.25	5.13	6.42	4.59	10.34	...
9	6.26	5.12	6 42	4 59	11.31	a.m. 12.3
10	6.26	5.11	6.43	4.59	...	12.57
11	6.27	5.10	6.43	4.59	a.m. 12.27	1.48
12	6.28	5.9	6.43	4.59	1.21	2.40
13	6.28	5.8	6.43	4.59	2.12	3.35
14	6 29	5.7	6.44	5.0	3.3	4.36
15	6.29	5.7	6.44	5 0	3.54	5.36
16	6.30	5.6	6.44	5.0	4.49	6.37
17	6.30	5.6	6.45	5.0	5.49	7.38
18	6.31	5 5	6.45	5.0	6.48	8.36
19	6 32	5.5	6.45	5.0	7.49	9.28
20	6 32	5.4	6.46	5.0	8.48	10.14
21	6.33	5.4	6.46	5.0	9.47	10.49
22	6.34	5.4	6.46	5.0	10.43	11.25
23	6.35	5.3	6.46	5.0	11.33	11.58
24	6.35	5.3	6.47	5.1	p.m. 12.11	p.m. 12.31
25	6.36	5.2	6.47	5.1	12.49	1.6
26	6.36	5.2	6.47	5.1	1.24	1.43
27	6.37	5.1	6.47	5.2	1.56	2.25
28	6.37	5.1	6.47	5.2	2.29	3.14
29	6.37	5.1	6.47	5.3	3.6	4.11
30	6.38	5.0	6.47	5.3	3.45	5.9
31	6.38	5.0	...	...	4.32	...

Phases of the Moon, Occultations, &c.

3 May.	○	Full Moon	3 14 p.m.
9 ,,	☽	Last Quarter	10 48 p.m.
18 ,,	●	New Moon	1 27 a.m.
25 ,,	☾	First Quarter	5 38 a.m.

Apogee, 12th May, at 11.18 a.m.
Perigree, 28th May, at 2.18 a.m.

At Warwick Mercury will rise 5 minutes before the Sun on the 1st, and one hour and 33 minutes before it on the 15th.

Venus will rise at 3.46 a.m. on the 1st, and at 4.4 a.m. on the 15th.

Mars will rise at 12.57 p.m., and set at 11.31 p.m. on the 1st; on the 15th it will rise at 12.21 p.m. and set at 11.13 p.m.

Jupiter will rise at 11.24 a.m. and set at 9.46 p.m. on the 1st; on the 15th it will rise at 11.27 a.m. and set at 8.47 p.m.

Saturn will rise at 10.13 p.m. and set at 11.47 a.m. on the 1st; on the 15th it will rise at 9.16 p.m. and set at 10.50 a.m.

The Southern Cross will reach its highest point and be in an upright position at 10 p.m. near the beginning of the month. It will then be due south, and its height above the horizon will be 58 degrees at Warwick, nearly two-thirds of the distance from the horizon to the zenith.

---

1 June	○	Full Moon	12 33 a.m.
8 ,,	☽	Last Quarter	4 18 p.m.
16 ,,	●	New Moon	1 1 p.m.
23 ,,	☾	First Quarter	10 23 a.m.
30 ,,	○	Full Moon	10 46 a.m.

Perigee, 9th June, ot 5.54 a.m.
Apogee, 22nd June, at 11 a.m.

Before daybreak on 4th June, Saturn will be five degrees northward of the Moon when nearly full, and both will be high overhead, but in a north-westerly direction, Saturn having passed the meridian about three hours earlier.

About 8 p.m. on the 16th the planets Mars and Neptune will be apparently separated from one another by a distance equal to the diameter of the Moon. They will appear to be amongst the stars of Leo, nearly four degrees or eight diameters of the moon to the eastward of Regulus, the brightest star in the handle of the sickle. In the absence of the Moon, which being new will set with the Sun, a favourable opportunity to find Neptune will be afforded to observers who have a telescope or binoculars.

On the 18th, about 3 p.m., observers may find it interesting to look for the Moon and Jupiter, which will be in the north-north-west. The Moon in sickle shape will be rather more than half-way from the zenith to the northern horizon. Jupiter, five degrees higher, will require telescope or binoculars on account of its position with regard to the Sun. Three days later Mars will be only two degrees south of the Moon, about 3 p.m., but the distance from the Sun will be considerably further to the eastward.

On the 29th, Mercury will be passing from west to east of the Sun on the far side of its orbit. Though presenting its full face to the Earth and one degree above it, the planet will be entirely lost in the Sun's bright rays.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/-, including postage.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXV. 1 JUNE, 1931. PART 6.

Event and Comment.

Buffalo Fly—Ministerial Announcement.

THE Minister for Agriculture and Stock, Mr. H. F. Walker, commented recently on a Ministerial statement in the House of Representatives, in regard to a plan drawn up by a conference of interested parties last year, and an assertion that the Queensland Government had failed to fall into line with the recommendations of that conference. Mr. Walker pointed out that, on the contrary, the recommendations made thereat were considered by him as the only practicable means available at that time for the prevention of the spread of the pest.

The resolutions adopted at the conference were agreed to unanimously, and the vital recommendations made were:—

"This conference would respectfully ask the Government of Queensland to cause an immediate inspection of the quarantine area to be made in order to determine whether there has been any extension of the infested area since last report; and, in the event of finding that no extension has taken place, that cattle remote from the infested area to the east and south should be permitted access to market after careful inspection.

"This conference is of opinion that, for the safety of Queensland and the Southern States, an effort should be made to push the fly-infested area back into Northern Australia before the more densely cattle-populated areas become infested. To this end it is recommended:—

(1) That a clean muster of the infested area in Queensland, and of Wollogorang and Calvert Hills in Northern Australia, should be made, and all cattle moved further into Northern Australia;

(2) That a buffer area, approximately 30 miles wide and kept free from cattle, should be established to the west of Wollogorang, and no cattle be allowed to cross such area.

"This conference is of opinion that the total cost of evacuation and fencing will not exceed £100,000, distributed over three years, and that approximately 50 per cent. of that cost will be recoverable from the sale of cattle evacuated."

There was no suggestion that the cost of the scheme would be apportioned on a fifty-fifty basis between the Commonwealth and Queensland Governments, as the finance was to be a matter for decision by the Governments concerned.

Queensland Government Action.

ON the first resolution, the Queensland Government took immediate action, and instructed its officers, who were already dealing with the problem in the area, to make a special survey of the country adjoining the known fly-infested area, with a view to determining whether there had been any extension. Subsequently, a letter, dated 11th June, 1930, was received from the Director-General of the Commonwealth Department of Health, advising that "the Commonwealth Government has given very careful consideration to the suggestions of the conference, but is unable to accept the scheme put forward."

Subsequent reports having revealed that the fly had extended a further 50 miles into Queensland territory, Mr. Walker stated that he again got into communication with the Federal Minister for Health with the view of concrete action being taken to prevent the further spread of the pest, and to eradicate it from present centres of infestation in Queensland. On the 20th November, 1930, Mr. Walker wired the Commonwealth Minister for Health as follows:—

> "Re buffalo fly. Authentically advised fly spreading alarmingly; imperative immediate steps be taken arrest rapid advance fly easterly and southerly beyond existing quarantine area, otherwise disaster Australian cattle industry positive (stop) Will you nominate convenient early date discuss this important national matter (stop)? I will meet you Canberra or elsewhere (stop) Understand Dr. Mackerras will report emphasising seriousness position and necessity for urgent effective action."

The suggestions for a conference at that time were unfortunately abortive. In February, 1931, while the Queensland Premier was in Canberra, he discussed the matter with the Federal Minister for Home Affairs, and Drs. Robertson and Tillyard. It was then decided that the first action to be taken was to make a survey to fix definitely the area of infestation, and the result of that survey would determine the action necessary to prevent any further spread. The survey was to commence about the beginning of April. The Commonwealth officers for the survey left Brisbane recently, a month late, although the Queensland officers detailed to assist in the survey have been on the spot during the whole season. On the question of funds, Mr. Moore intimated at this conference that the Queensland Government, while it was prepared to co-operate and help in every way to try and stop the threatened scourge, had no adequate funds, without the assistance of the Commonwealth, to erect fences and pay compensation for the compulsory evacuation of cattle from the infested areas. No offer, however, has ever been forthcoming that the Commonwealth would bear any definite share of the cost.

With regard to the statement that Queensland is the only State affected, the following extract from a letter, dated the 3rd April, 1931, from the Prime Minister, Mr. Scullin, provides a sufficient answer:—

"So far as the question of liability is concerned, the matter may be considered from three aspects—

(1) As an interstate-territorial matter, as between Queensland and the Commonwealth, as the authority controlling the Territory of North Australia;

(2) As an intra-State matter, so far as it affects Queensland itself;

(3) As a national matter, from the Commonwealth's point of view, as it concerns directly the States of Western Australia and Queensland and the Territory of North Australia, and indirectly the State of New South Wales."

There is no justification whatever for the reported statement that the Queensland Government would not accept any responsibility. At all times, Queensland has endeavoured over a period of many years to co-operate with the Commonwealth and get it to announce the basis on which it would contribute financial assistance. There is no scintilla of doubt that had the Commonwealth taken the action recommended in the first instance by the Queensland Government, the entry of the buffalo fly into Queensland could have been effectively prevented.

At the present time, Mr. Walker added, his own Department was taking every action possible to prevent the further spread of the fly. As a matter of fact, since March, 1929, no cattle whatever have been allowed to leave the infested and suspected area to enter any other portion of Queensland, and although it is recognised that this is not, or could not be expected to be, fully effective, still it has materially retarded the extension of the fly.

So keenly interested is Mr. Walker in the matter that he arranged to personally visit that portion of Queensland which is threatened by this menace, and is now in the Gulf Country carrying out investigations on the spot. This visit has no political significance whatever, and is purely in the interests of the cattle industry of Queensland and of Australia in general.

Control of Banana Thrips—£1,000 Reward Offered.

HIS Excellency the Governor in Council has approved of the issue of a Regulation, under the Fruit Marketing Organisation Acts, authorising the Committee of Direction of Fruit Marketing to offer a reward of £1,000 for an effective scheme of treatment for the control of banana thrips. The conditions are similar to those in connection with the reward for the control of beetle borer in bananas, an exception being that the members of the Banana Industry Protection Board will comprise the committee for adjudicating upon claims in connection with the reward.

In the event of the reward being paid, the Committee of Direction shall recoup such expenditure by a levy on Queensland banana-growers.

Certain conditions apply to an application for the reward; every applicant must agree to the Investigation Committee's interpretation of any of the conditions, and accept its decision as final. The scheme submitted shall be new, and must not be one which has previously been recommended by either the Department or Committee of Direction.

The claimant for the reward must produce satisfactory evidence that preliminary trials have yielded promising results, and must be prepared, at his own expense, to demonstrate his scheme of treatment in a series of field trials on an area approved by the Investigation Committee, and under the committee's supervision. The committee may take samples and submit same to a qualified chemist or analyst. The committee may also be supplied with sufficient material for further treatment on additional areas, and shall carry out such work, the cost of same being borne, in this instance, by the Committee of Direction. Field trials must be run for a period of six months.

The payment of the reward shall make the scheme of treatment approved the absolute property of the Committee of Direction. No reward shall be paid unless the Investigation Committee is convinced that the scheme is commercially practicable and will provide an effective control over the banana thrips, and be a decided advance over any scheme now available by the Department of Agriculture.

The claimant, when submitting his scheme, shall state in writing all details and all particulars required by the Committee of Direction. The Committee of Direction, at any time, may withdraw the offer, and it shall not be liable to pay the total reward to more than one person, although the reward may be divided between two or more claimants as the committee may decide. No proceedings shall be allowed against the Committee of Direction or the Investigation Committee in respect of any injury or loss sustained by the claimant.

Australian Butter in London.

"AUSTRALIAN butter was never so high in public favour before. The Queensland factories are outstanding. The extraordinary thing is that all Australian butter so far has been sold, but New Zealand butter at the same prices as Australian has not had so ready a sale, and there are almost 200,000 boxes of New Zealand butter remaining in cold stores unsold. So their butter is not so popular as formerly.

"The fact is the public are now waking up to the fact that the best brands of Australian butter have really a better flavour than that from New Zealand."

The foregoing comment on the quality of Australian butter reaching the London market is taken from a letter from an English correspondent to Mr. W. T. Harris, Secretary of the Queensland Co-operative Dairy Companies' Association. It makes very gratifying reading for Queensland dairy farmers.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART XV.

(c) Mills and Milling Work (*Continued*).

BEFORE leaving the subject of the early sugar mills, it may be stated that a Royal Commission was appointed late in 1888 to inquire into the general condition of the sugar industry in Queensland, and to report upon the causes which led to the then languishing condition of the industry throughout the Colony, and the best means to be adopted for reviving and maintaining its prosperity. This Commission, which consisted of W. H. Groom, M.L.A. (chairman), and Messrs. King and Cowley, commenced its duties in January, 1889, and presented voluminous reports in April of the same year. The majority report was signed by Messrs. King and Cowley, while the chairman signed a separate report. This Commission will be referred to in a later article, meantime only matters in relation to sugar mills will be dealt with, and from the evidence presented a very dismal picture of the cane industry at this time was painted by the witnesses.

Port Douglas.

The Commission commenced taking evidence at Port Douglas, in which district at that time many tropical products were being tried, including citrus fruit, coffee, and also some cane which was sent to a Cairns Mill and the Bloomfield Mill for plants. Mr. J. D. Johnstone, an old Mossman identity, stated he was clearing his land for sugar growing, as his brother Mr. W. Johnstone intended to start a mill at Mossman. This, however, never took place. At that time the Brie Brie sugar plantation was in liquidation, the owner was stated to be insolvent and the kanakas had not been paid.

Cairns.

Pyramid plantation at Cairns, which was next visited, was in the hands of the bank, but was still operating. The manager, Mr. Langdon, considered that £130,000 had been expended on the mill land and plant, and there were some 670 acres under cane. There were 212 kanakas, 24 Japanese, and 60 Europeans employed during the crushing. Mechanics got £2 10s. a week with rations and lodgings, and bullock-drivers and draymen got from £1 15s. to £2 per week with rations and lodgings. The estate was not paying its way. The depression in the industry was caused by the labour question and the low price of sugar. Grubs gave them a lot of trouble. Most of the machinery was made in England, but a set of clarifiers had been made by Walkers Limited, Maryborough.

At Hambledon there were 6,000 acres in the estate; 900 of which were under cultivation, producing in 1888, 1,100 tons of sugar. Most of that sugar was sent to Melbourne. About £180,000 was invested, but no return on interest had been received. The annual expenditure was some £23,500. The lowest rate of wages paid to white men was £2 2s. a week, the men keeping themselves. Chinese were paid £1 5s. a week and find themselves. Kanakas' wages varied from £6 to £8 a

year. All the ploughing was done by white men. There was about £33,000 worth of machinery in their mill; of that £8,000 was for colonial machinery made by Walkers Limited, and also at Mackay and Townsville. Their trouble mainly was the competition with bounty-fed sugars. It took about 12 tons of cane to make 1 ton of sugar in 1888, but the mill had made it for less than that. One of the Swallow family at Hambledon said, "I look on the fruit trade as being the great trade up here, better than sugar." At that time there was a large quantity of bananas being grown, and rice was also grown at Cairns.

The late Archie Meston and others proposed to put up a mill at Freshwater, about 1881, but owing to the dread amongst sugar planters that kanaka labour would be abolished suddenly, they countermanded the order for mill machinery.

Andrew Leon, a native of China, said he had been in the Cairns district since 1875 and was the first man to take up a selection. This was 3 miles from Cairns and known as Hop Wah. They started to grow sugar-cane after trying cotton. The cane grew well, but the crop did not turn out well. They employed Chinese labour at about £40 to £60 a year, with rations. The plantation did not pay and they had to sell it and made a loss of some £29,000.

Messrs. Draper, McKnight, and Hobson, who purchased the Hop Wah plantation from Leon also stated they lost money for want of adequate labour. The machinery was of good description; they had a vacuum pan and one set of rollers; the sugar produced was of good quality.

Innisfail.

The Commission next sat at Innisfail. Giving evidence, the manager of the Innisfail Mill and plantation said they had 400 acres under cultivation. About £36,000 had been invested in the mill and plantation, which was solely Mr. Fitzgerald's investment. There was a mortgage on it, and the mortgagee, Miss O'Reilly, had taken the place over. He found Europeans were not much good at field work; they were no good with the hoe. They would do ploughing and following horses, but nothing else. They worked as well at that as the men on the Downs, but they could not stand hoeing. He never saw a white man who would continue to work on a canefield. He considered the kanaka did best in the cane, but they could not get enough labour; they were just keeping themselves since Miss O'Reilly took the mill over. The estate was just paying its way, but no interest on the debt. That was dead capital gone. The value of the plantation land was £7 an acre. (*Note this valuation of some of the finest land in Innisfail worth to-day from* £70 *to* £100 *an acre for sugar-growing.*) The manager employed ploughmen at £1 per week and tucker, and they would have to be very good at that. The labour question and the low price of sugar were the greatest drawbacks. Mr. C. Nolan bought the crop one year, and he tried to work it with white labour only, and he said he lost between £500 and £600 for three months' crushing. He bought the cane as a speculation, but had no knowledge of the business.

Mr. G. E. Adams, manager of the Goondi Plantation and Mill, owned by the Colonial Sugar Refining Company, stated that the total area of Goondi was 12,500 acres, and 2,300 acres were under cane. During the previous year (1888) the cane from 1,127 acres had been crushed, and they expected to take cane from 2,090 acres during the

current season. About 2,400 tons of sugar were made in 1888. In that year, 120 Europeans, 271 kanakas, and 44 Chinese, were employed. Some of the land was leased to Chinamen. Double crushing and maceration were used in the mill, and there was a triple effet and a vacuum pan. The mill machinery was made in England and Scotland, and *he was happy to say none of it was Colonial made!* Only whites were employed in the mill. The employment of aboriginals was not a success, as if they employed one he generally brought all his relations with him. Asked what effect the shutting out of the kanaka in 1890 (as was then proposed) would have, the witness said he expected he would have to shut up. White labour would not do in the fields.

Mourilyan was the next mill visited. At that place Mr. R. Smellie, who was one of the partners in the Mourilyan Sugar Company, gave evidence. He said the profit had been almost nil in working the plantation, and the proprietors had not withdrawn a single shilling for salary or anything else; they lived on their means. There were 5,000 acres, 1,200 were cleared and about 850 under cane. In 1886, they made 2,000 tons of sugar, 1888 about 1,000, and the present year (1889) they expected to make 1,000 tons—this was in consequence of the drought. Over £120,000 had been expended. Sugar had fallen 50 per cent. in price since 1884. It took from £1,000 to £1,200 a month to work the plantation. They employed Javanese and kanakas in the field, and about 25 Europeans in the mill during crushing. A rather interesting light was thrown by the witness on the subject of non-British but European labour, which the manager tried to get in 1885 when the Queensland Parliament passed an Act to enable employees to introduce labour from the continent of Europe. When the Act became law he arranged with his agent in London to go over to the Continent and send out forty men. When the agent got to the Continent he found that the Continental powers would not permit the Act to be put into operation. He subsequently obtained thirty labourers from England at £30 to £40 a year, but they were not successful at mill work and made many serious mistakes. They did not appear to want to work and they finally only kept one of the lot. It was their intention to have worked the plantation by white labour; this was the start of it and this was how they were treated. If a white man was asked to work in the field then he used to ask if he were a kanaka. The mill had a double crushing plant and maceration was used. They burnt wood and megass, but no coal; they had tramlines and two locomotives, and the machinery was of the very highest class at the time. They got 1 ton of sugar from 10 tons of cane in 1888. It was estimated they lost 6 per cent. saccharine matter in the bagasse, equal to 2 per cent. of the cane. No more complete plant existed than the Mourilyan plant. It had every appliance. Aboriginal labour was not reliable. The heat was such that a white man could not work in it—that is, during the summer. The depressed state of the sugar industry was caused by the low price of sugar owing to over-production, and that over-production was stimulated by the bounties to beetroot sugar. Another great cause was the uncertainty of labour. If they could employ more kanakas they could extend their operations. A plantation is the same as any other commercial industry. A small mill will not pay. Take the Mourilyan Mill; it could produce 15 tons of sugar per diem. He could put up another mill and produce 30 tons a day with no more expense than the product of the one mill. It takes just the same time to boil a pan of 5 tons as it does to boil one of 20 tons. The sugar

industry would flourish in Queensland when a number of small plantations joined together and amalgamated. At the Mourilyan Mill they used the Despessies process in the manufacture of sugar. They used sulphur and superphosphate. The witness went on to give the following outline of the process of the manufacture of sugar, at that time in use at the Mourilyan Mill, which at present should be interesting for many reasons. It will be seen therefrom that white sugar was made direct for the market:—

"The juice, as it flows from the crushing mills, is received in a cistern where it undergoes the first stage of the process called the sulphuring. Our clarifiers are each of a capacity of 800 gallons, and for this quantity of juice, of a fair quality, we use from 2½ to 3 lb. of roll sulphur, which is burned in a small furnace and the fumes therefrom are forced through the juice by means of an injector and jet of steam. The action of this sulphurous acid disengages a considerable quantity of impurities from the juice, and leaves it purer, and in a manner bleached, and considerably acid to the litmus paper test. This acidity is rapidly destroyed by adding milk of lime till the juice becomes neutral. As a matter of practice we usually add this lime gradually as the clarifier is being filled. The juice is then brought to the boiling point, and superphosphate or Ehrmannite, containing from 40 to 50 per cent. of free phosphoric acid, is then added in quantity (usually from 2 to 3 lb. for ordinary cane juice) in order to bring the liquor back to the natural acidity of the juice as it exists in the cane; this acidity is again destroyed by the addition of a little more milk of lime. And at this stage samples are always taken in a test-glass for careful examination. The litmus paper should show the juice to be *about* neutral. If the impurities appear, in the test glass, to precipitate rapidly in *large* flocules to the bottom of the glass, leaving the juice bright and clear, like pale sherry wine, above, the defecation may be considered complete, and it is then run down to the subsider. Every care ought to be taken at the clarifiers to have the juice thoroughly defecated, as any defect here cannot be afterwards rectified in most mills; but in mills supplied with filters the syrup can again be re-treated and any mistake at the clarifiers thoroughly rectified. In examining the sample in the test-glass, if the impurities are in very small flocules, merely black specks continually revolving in the liquor, and apparently unable to precipitate, it is a pretty sure indication that a *little* more lime should be added; but added in small quantities with care. The liquor remains in the subsiders as long as the requirements of the after-process will permit, in order that all the disengaged impurities may precipitate. The clear juice is then drawn off to the apparatus called the triple effet, where it is evaporated in vacuum at low temperatures to a density of 23 B. The syrup, at a temperature of 140 deg. Fahr., is then discharged into what is technically called the re-heating tank. Here the syrup is brought up to the boiling point, for the purpose of coagulating the albumen, and disengaging it from the syrup, and thus assisting the syrup to filter more freely through the filter bags. At this stage we always add to the syrup a little superphosphate and neutralize with milk of lime, leaving it nearly neutral, but rather to the acid side than otherwise. The syrup here should be bright, clear, and sparkling. It is then run into Taylor's filter bags, where the albumen and other impurities in the syrup are extracted. It is then boiled in vacuum pans in the usual way, and as massecuite is discharged into a receiver and mixer situated just above the centrifugals, and is dried while still

hot. The sugar, on being discharged from the centrifugals, is passed through a drier, from which it is bagged direct, and is now ready for market. This is the whole process without interruption, but there are a great many most important details which will show on the debit or credit side of profit and loss according to the care with which they are attended to and carried out. To go back to the subsiders, when the clear juice is withdrawn from these, there remains about 70 gallons of juice containing the lime, superphosphate as used in clarification, and the impurities of the subsidence. This is run down to tanks, where it is brought to the boiling point, and by means of a mont-jus with a steam pressure of 70 lb. to the square inch is forced through the filter presses, where the clear juice is disengaged, leaving in the presses all the impurities in dry solid cakes. These cakes, by this process, are very valuable as a manure. It will be noted that if these presses are not worked with extreme care, and under constant supervision, ignorant and careless men may cause considerable loss, and mill managers cannot be too careful in having all their connections fixed in such a manner that waste in this quarter should be easily detected. Superphosphate should always be added first and neutralised with lime—if the lime be added first it tends to colour the juice, which no after process can rectify. There has been considerable discussion in some quarters about the benefits or otherwise in the use of sulphur, and in 1886 I had a communication from a home firm requesting me to put the question to the test and report my experience. From close attention to the mill work night and day for six months I was perfectly satisfied that the use of sulphurous acid did increase the quantity of crystallizable sugar, and so reported then, which was adverse to the opinion of an old refiner. For the last two years I devoted my whole attention to the mill work in its every detail, and am still of the same opinion. I may here add that the report of the Commissioners of the Agricultural Department of the United States, who have been engaged for three years practically testing the manufacture of sugar by the diffusion process, has just been published, in which they announce the fact that the use of sulphurous acid does increase the quantity of crystallizable sugar extracted from the cane. This company has also a complete charcoal plant, but for many reasons I prefer the Despessies process as carried out by us and described above. It is more rapid, we get a better defecation, less liable to waste, and no sweet waters to evaporate. The chief use of filtering syrup through animal charcoal is to decolorize it, but if this colour is caused by material impurities held in solution, it has no power to do so, and hence defecation must be very perfect in order that the full benefit of charcoal may be obtained. This is very difficult by the ordinary lime process in so general use, and the only process I know of to attain this object is to largely overlime the juice, and to discharge it with carbonic acid."

In concluding his evidence Mr. Smellie said he believed the sugar industry was the greatest industry in Queensland not excepting gold, tin, copper, or any other minerals, or even squatting. If it were flourishing he believed that they could export from Queensland over £10,000,000 worth of sugar, &c., per annum. Hitherto it had received no encouragement, the planter and all his operations had been looked on as if he were an enemy to the country. These roseate dreams of a £10,000,000 export have not been realised, but Mr. Smellie was one of the first to recognise the potentialities of the Johnstone River district in the possession of rich river banks and scrubs.

The next mill visited was the Queensland Sugar Company's plantation "Innishowen," of which Mr. W. Canny was then manager. There were about 3,840 acres of which 600 were under cultivation. They had crushed the cane from 400 acres during the last season and made 300 tons of sugar. £80,000 was invested in the estate, but the plantation did not pay interest on its outlay and the working expenses. The annual working expenditure was between £7,000 and £8,000. They employed kanakas, Malays, Chinese, and Europeans. During the crushing they had Chinese to whom they paid £1 8s. a week for cane cutting, and they had from fifteen to twenty Europeans. The engineer got £4 a week, the sugar boiler £3 a week, and a second sugar boiler £2 10s. a week, carpenter £2, baker £2, and blacksmith £2 10s. per week, and the overseers about £80 a year. All these men got rations and quarters; where married they got double rations. There was a general disinclination amongst white men to do trashing or field work except ploughing. The machinery they had in the mill was crushing plant, triple effet, vacuum pan and centrifugals made by the Fives-Lille Company in France. No Colonial made machinery was used. The average cost of overhauling French machinery was more than English. The climate was more trying than Maryborough. The contractor doing work for the Divisional Board wrote the witness as chairman that he had to stop all Board contracts on hand as none of his men could stand the heat; this was in December. The average yield per acre was from 20 to 26 tons of cane. They suffered from scarcity of labour and the cane grub. The low price of sugar had something to do with the depressed state of the industry, and he did not think they would ever have the high price for sugar again. Asked what the effect would be if the kanakas were abolished in 1890, witness said it would mean the closing up of the plantation, it would be impossible for them to employ European labour except at a cost of many thousands per annum. He would not recommend the employment of the kanaka if he thought white men could do field work; white men were all right in the mill.

Herbert River.

The Commission then moved on to the Herbert River where Mr. F. Neame of the Macknade Plantation gave evidence. He stated the total area of the plantation was 6,856 acres, 690 being under cane. In 1888, they crushed cane from 500 acres and made 725 tons of sugar and about 25,000 gallons of molasses. Most of the latter went to waste but some was used for manure. The Macknade Sugar Company had about £135,000 invested, and they had spent another £18,000 since his firm had taken it over and it was worked at a loss. It did not pay interest on the expenditure. The annual expenditure was some £15,000. They employed about 30 Europeans, 20 Chinese, 90 kanakas, and 73 Malays. Europeans got on an average £80 a year, Chinese 16s. a week, kanakas £8 13s. 6d. a year, and Malays £1 9s. 2d. a month, rations being supplied in all cases. He had never employed Europeans on field work outside ploughing, and never found such labour willing to take same. In the mill one engineer was paid £200 a year, and the other £3 a week, everything found. It took about 10 tons of cane to make a ton of sugar. They had double crushing and all labour-saving appliances, and they macerated. The capacity of the mill was some 150 tons per day. They at one time had sold the mill but the purchaser made a loss of about £20,000 a year, and the present firm of Neame Brothers had to take it back.

The Ripple Creek Mill was next visited and one of the partners, Mr. R. M. Boyd, gave evidence. The area of the plantation was 1,650 acres, 800 of which were under cultivation. The previous year they had crushed 620 acres of cane, and had made 1,025 tons of sugar and 38,000 gallons of molasses, which was thrown away. £85,000 was invested in the estate, but nothing was returned by way of interest. The machinery cost £30,000 and had been manufactured in Glasgow. He had personal knowledge of one plantation on the Herbert that had lost £100,000. It had been offered to him for £20,000. Hamleigh Plantation also had lost about the same amount and was sold for £12,500.

Gairloch Mill was the next on the list and Mr. L. G. Cowley examined. He said Fanning Nankivell and Company were the original owners. The machinery now in the mill cost about £40,000 and the total area of the estate was about 4,600 acres, of which 1,200 were under cane. The mill never exceeded an output of 900 tons of sugar, but if kept going regularly it could turn out 2,000 tons per season. He thought Fanning Nankivell invested £120,000, but the plantation did not pay working expenses and they disposed of it. It was offered by auction in Melbourne but they could not sell it. Afterwards they got about £21,000 selling to different people. Five hundred acres were sold to Boyd; horses, plant, and tools to the Colonial Sugar Refining Company; and land and buildings to another company. It was owing principally to the difficulty in getting reliable labour that the plantation did not pay, also to the low price of sugar, but if there was reliable and cheap labour it could be made to pay. He considered kanaka labour the best for cane. He believed the white man was physically capable of working in the cane, but they required such high wages that planters could not afford to pay them.

The Commission then proceeded to Hamleigh Plantation and Mill and called Robert Grierson Blackmore, the manager of the estate. He stated that the former owners were Hamleigh Sugar Company, but it was now owned by Whittingham Brothers, of Melbourne. The extent of the estate was 4,700 acres, of which 500 were under cane. There were 1,500 acres of good cultivable land. They did not crush in 1888, as they were unable to do any planting and could not get a crop in. They hoped to have a crop the next season. Originally £120,000 had been invested, but Whittingham Brothers only gave £13,000. The property was sold by public auction, and £13,000 was the highest bid for it. Europeans, Javanese, and Chinese were employed, as well as Polynesians. He did not think they could improve on the kanaka for cane cultivation; he had never been able to get Europeans to even think of hoeing and trashing. The value of the mill and buildings was between £30,000 and £40,000. Practically all the machinery had been made in Europe, though there was some locally-made stuff amongst it. The machinery was the best that could be got for the money. The mill could turn out some 2,000 tons of sugar per annum. The witness agreed that the chief cause of the depression in the industry was lack of reliable labour and the low price of sugar. He did not favour Chinese labour; they were not desirable and of no benefit to the country, and they impoverished the district by taking all the money they earned out of it.

At the Victoria Plantation, the property of the Colonial Sugar Refining Company, Mr. Wm. McLean, acting manager, said the area of

PLATE 94.—REFRIGERATOR OR COOLER IN ONE OF THE OLDER MILLS.

This is for using water over and over again. The condensed water is pumped to the top, falls through the various platforms of twigs, &c., into a reservoir below, and is then pumped back into the mill. These coolers are used in districts where the water-supply is scanty.

the plantation was about 20,000 acres, and between 2,000 and 3,000 acres were being cultivated. Molasses was a waste product. They paid ploughmen £1 a week, mill hands from £1 to £3 a week, engineers £3 10s. to £4 10s., all with rations and quarters. The whole of the land was under cultivation by implements. They had double crushing in the mill, macerated, and employed chemists. The company had 18 miles of permanent tramline worked by locomotives.

Lower Burdekin.

The Commission next visited the Lower Burdekin district and examined Mr. Charles Young, of the Kalamia Plantation, who said the estate comprised 7,000 acres. In the preceding year (1888) they had crushed cane from 300 acres, and had made 140 tons of sugar. The amount of capital invested was £90,000. It returned no interest, and last year there had been a heavy loss. The mill cost about £20,000, and the annual overhaul a little over £200. They used irrigation costing about 7s. 6d. per acre, and had any quantity of water. The reason they had such a poor crop in 1888 was that they had a very heavy crushing in 1887 and could not get labour to take it off and cultivate the land for the next season. He was of opinion that if they could not get kanakas after 1890 the industry would have to close up. He and his brother managed the estate; they were not the owners—they once were. They did not have double crushing, but they had vacuum pans, triple effets, and filter presses. It took from 1,500 to 1,700 gallons of juice to make 1 ton of the best white sugar. The mill had a capacity of 1,500 tons and they had made one year about 1,350 tons. They could not afford to trash the cane, but burnt it sometimes, which was a very dangerous process and they had some nasty fires.

The next mill taken was the Airdmillan Estate, of which Mr. Archibald Campbell McMillan was formerly local director and manager. The total area was 15,000 acres, of which 1,500 acres were once under cultivation. About £200,000 had been invested, but never at any time had it returned any interest, and the mill had been closed down in 1886 and the whole of the land thrown out. The cause was that the English shareholders were satisfied that the Legislature of the country was against the industry and would go no further with it. If the kanakas were abolished in 1890 the industry would shut up.

Mr. James MacKenzie was the next witness and said he had established the estate known as "Seaforth," but he was not owner now—only manager. There were some 2,500 acres in the plantation, of which 800 were under cultivation, 570 being at present under cane. Only 250 acres were crushed last season (1888), and 250 tons of sugar made. From £85,000 to £90,000 had been invested in the property, but he had never had any return from the capital invested nor did the estate pay working expenses, and practically all the capital he had invested was gone. He had once employed a white man (who was hard up) at cane-cutting. He kept up at cane-cutting with the kanaka for a day, but the next day he disappeared. One season he had an Italian, who stuck to it the whole season, and these were the only instances he had known of white labour. Kanakas were the best field labourers. His mill had cost £22,000 erected, and the annual overhaul £300 to £350. The expenses in 1887 were a little over £15,000 and they made 1,760 tons of sugar. They used irrigation, but could not

irrigate last year owing to the heavy crop and insufficient labour. If they had been able to cultivate and irrigate they would have had a much better crop. They were using filter-press cake for fertiliser. He considered the plantations were conducted more economically than formerly, and more sugar was extracted, and there were more labour-saving appliances, and things were more carefully looked after.

The next mill was Pioneer. The late John Drysdale gave evidence that he was the manager for Drysdale Brothers, but was not a member of the firm. Four of his brothers were in it, and one or two others. It was a sort of private company. The total area of the estate was 5,800 acres, of which 1,270 acres were under cane. The cane from 800 acres was crushed in 1888 and 650 tons of sugar were made. They did not measure the molasses but ran it away down a drain. In 1887 they had made 2,550 tons, as 1887 was a very good year. He put the deficiency down entirely to the drought. The capital account stood at £96,000. There was a profit and loss account of £12,000 to the bad and a loss of interest on £50,000 for six years—that is, they had made no interest and had lost £12,000. The working expenses for 1888 were £16,145. They employed 40 Europeans, 8 Chinese, 7 Cingalese, and 244 kanakas. The estate practised irrigation and their main pumping station raised 4,000,000 gallons per day of twenty-four hours, which would irrigate from 16 to 20 acres. Each flooding cost 5s. per acre, not including interest on capital or wear and tear of machinery. It certainly paid to irrigate, and they were extending their operations, which would bring 150 acres more under the system. The cost of the machinery in the mill was estimated at £30,000, and the annual overhaul about £400. They had to get their sugar to Townsville by bullock waggons and steamers. It was most unsatisfactory; the steamers were too uncertain and the arrivals and departures were entirely dependent on the tides. Railway communication would be a great improvement. Another witness questioned as to white labour said he would never think of trying it. Even if sugar were at a high price and they could afford to employ Europeans, his experience led him to say they would not do the work.

[TO BE CONTINUED].

FACTORS IN SOIL FERTILITY.

Valuable as they are, there are limitations to what fertilizers can accomplish. Want of plant-food is, of course, a common cause of infertility, especially in the case of land which has been exhausted by repeated croppings without manuring or rotation. Proper manuring, giving due consideration to the requirements both of the soil and of the crop, is the remedy, provided that the land is in good condition; but the important fact must not be lost sight of that the mere addition of plant-food is not sufficient unless the soil is in such mechanical condition that it can make good use of the manure applied.

Deficiency in humus is a common cause of infertility. A soil deficient or wanting in humus is less able to withstand droughty conditions, lacks cohesion, and is easily blown or washed away, and is unfavourable to the growth of micro-organisms.

Absence of bacteria, particularly of the nitrifying organisms, is prejudicial to the satisfactory production of crops. The cause is generally want of aeration, lack of lime or vegetable matter, sourness, bad tillage or drainage, &c., and when such soils are restored to good condition the development of the nitrifying organisms will proceed normally.

Manuring alone is not likely to be of any benefit on land that is badly drained, sour, or in bad tilth.

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following entomological advice from the Northern Entomologist, Mr. E. Jarvis:—

Cane Grubs at Their Worst.

During this month fully-grown grubs of our "greyback" cane beetle will be found commonly on infested areas, on which they will have either so damaged the stools as to cause them to fall over in places, or levelled considerable areas of cane by devouring all the roots and portions of the basal ends of the sticks. It is now too late to practise remedial measures, seeing that most of the damage has been done, and the grubs are beginning to think about tunnelling downwards in order to construct earthen chambers in which to transform into the pupal or chrysalis condition. If desired, these pupæ can be destroyed later on by fumigating the ground with carbon bisulphide at any time during July to October; most growers, however, preferring to leave the beetles to ultimately emerge from such infested land in November or December, in the hope that when doing so they will wing their way to other fields in which to deposit their eggs. It is well to remember, however, that should numerous feeding-trees of this insect happen to be situated within half a mile or so to the north-west of such pupæ-infested land, the beetles arising from it may migrate to these trees and after feeding there for a couple of weeks perhaps return and lay their eggs in the vicinity of the land which gave them birth.

Be Prepared to Fight Leaf-eating Caterpillars.

Keep a lookout for the appearance of caterpillars of the army worm and other noctuid moths, which during this month may invade canefields and attack the leaves. Such larvæ are best combated by the use of poison sprays, arsenate of lead having proved to be the cheapest and most effective for this purpose.

Caterpillars of our common army worm (*Cirphis unipuncta* Haw.) attain a length of about 1½ inch and can be easily distinguished by being striped lengthwise, the colour varying from light greenish-yellow to greenish-black. Three distinct lines occur on each side, the middle stripe being nearly black, while the lowest one is usually light greenish or pale yellow. The head is greenish-brown mottled with blackish. These caterpillars generally conceal themselves by day amongst the unfolding heart-leaves of cane, seldom moving forward in army formation unless in search of fresh food.

Ordinary invasions of this pest from grass land adjoining a canefield are effectively controlled by spraying the cane leaves with lead arsenate, in such manner as to form a poisoned strip or band about 20 feet wide immediately in front of the line of advance being taken up by the caterpillars. In cases where such invasion has remained unnoticed, and the caterpillars have already become established throughout a block of cane, those portions appearing to be the most seriously affected should be sprayed first. Use 2 to 3 lb. of lead arsenate in about 50 gallons of water, taking care to keep the mixture well agitated whilst spraying it over the leaves, in order to ensure and maintain uniform suspension of this arsenical in the water.

What Spray Pump to Use.

The kind of pump to select will depend very largely on the size of the farm. On small holdings the "Vermorel Bucket Pump No. 10" will be found suitable for many purposes other than the spraying of cane stools.

The foot rest can be adjusted to suit any size bucket, petrol tin, &c., and being fitted with a large compression chamber and automatic agitator a powerful and continuous spray is ensured, as well as a uniform application of any arsenicals used. The price of this pump is under £2. For larger cane farms the "Presto" spray pump would probably meet requirements in many cases. This is mounted on a wheel and fitted with push handles, three strainers, agitator, self-clearing swivel nozzle, and large compression cylinder. One with a 6-gallon capacity costs £6 10s.; that holding 11 gallons, £7 10s.

Either of the above spray pumps may be seen in action at any time at the Meringa Experiment Station.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following notes on the biological control of insect pests from the Entomologist at Meringa, Mr. E. Jarvis:—

Attempts to control grasshoppers biologically have, up to the present, proved unsuccessful. An effort was made in 1914 to destroy locusts injuring sugar-cane in Reunion by introducing the disease *Mucor exitiosus* Mass. Bordage tells us, with regard to this attempt, "In the laboratory the result was very satisfactory, as it was there possible to maintain the temperature and moisture conditions most favourable to the propagation of the fungus; but in the field the same success was not met with." This has been the experience elsewhere, both in Queensland and other countries, when seeking to employ such a control method against insect pests. The Metarrhizium fungus, for instance, destroys a certain percentage of grubs of our "grey-back" cane-beetle each season during autumn months, this being the time of year when the moisture and soil temperature happen to be favourable to spore germination. Attempts made by us here to utilise this disease at any other time of year have never proved satisfactory.

Again, Beltran remarks, in connection with attempts to employ *Coccobacillus acridiorum* against grasshoppers: "It is pathogenic under certain conditions only, especially during rainy weather, natural spread of infection being very low and unimportant. Fatal effects can be obtained by injections of a culture into the body of the locusts, but not by feedng them on plants sprayed with a culture, and the disease appears to be of no value for their control."

In recent years such experiments have not met with success in the field, and the fight against locusts at the present time is being effected by the following methods:—

1. Spraying;
2. Dusting from aeroplanes;
3. Rolling;
4. Poison baits;
5. Barriers;
6. Burning;
7. Flooding eggeries;
8. Harrowing eggeries;
9. Driving into ditches;
10. Burning;
11. Collecting by mechanical means, &c.

Similarly, we are aware that experimentation carried out since the year 1878—when Metchnikoff first tried to utilise fungoid and bacterial diseases against injurious insects—has not led to the discovery of any disease which can be profitably employed to combat cockchafer beetles. If the well-equipped laboratories of France staffed with trained bacteriologists who have been concentrating on this question for the last thirty years or more have not yet solved the problem of effective control of these beetles by the use of contagious diseases, we can, I think, afford to disregard this phase of insect control, and turn our attention to the above-mentioned remedial methods which have given positive results in the field.

As already pointed out in various reports published by our Sugar Bureau, the fumigation of soil infested with cane-grubs offers the greatest possibilities in this connection. Both paradichlorobenzene and carbon bisulphide have been proved effective against these pests during the past season under practical field conditions. The cost of such treatment is certainly high, but in many cases growers are using a mixture of two fumigants when one of them would do the work required, thereby needlessly incurring an additional outlay of 20s. or more per acre. In any case, the advantages of grub fumigation must be apparent to all concerned, when one reflects that on a crop, say, of 30 tons to the acre, four of those tons would cover the cost of such fumigation, and thus save the remaining 26 tons of cane; whereas, otherwise, the entire yield might be lost, together with the ratoons for the following season.

Regarding the question of using guns designed to eject poisonous gas, with the view of destroying beetles when congregating in their feeding-trees, such procedure would perhaps be feasible; but the chances are that many of the beetles when first aroused from their torpidity would seek to escape by flight before becoming overpowered by the toxic gas.

A simpler plan, I think, is to collect them in the usual way by shaking these trees just after daybreak. This method of capture does not alarm but merely causes them to release hold upon the leaves and fall to the ground, where they usually remain in a sleepy condition until picked up and thrown into a sack. Such work, which can be done by boys or children, should be carried out in all districts where serious trouble is being caused by this cockchafer beetle.

CONGRESS OF TECHNOLOGISTS.

The Vice-Chairman of the Australian Section of the International Society of Sugar Cane Technologists (Mr. H. T. Easterby) has been advised that the Fourth Congress of the society will be held at San Juan, Porto Rico, early in 1932—probably in the month of March. It is particularly desired that a strong delegation of Queensland sugar technologists should attend, as it is hoped that the following Triennial Convention will be held in Queensland in 1935. The Queensland Society of Sugar Cane Technologists intend sending a delegate, and it is hoped that others will also be sent. These congresses are becoming of increasing importance, and Queensland's most important agricultural industry must be kept to the fore.

At Porto Rico, next March, the sugar season will be in full swing, the climatic conditions most favourable, and visitors will be able to see more of the sugar industry in both field and factory than at any other season of the year. There will be many excursions to sugar plantations and other places of interest. The Conference held in Java in 1929 was eminently successful, and a great amount of most useful work was accomplished. It gives the delegates an opportunity of meeting the most brilliant sugar-cane scientists from all parts of the world.

LIME FOR CANE LANDS.

With the very encouraging results which have been obtained in North Queensland during the past year or two, following the application of lime on acid soils, we are constantly receiving inquiries from interested growers for advice as to whether their land would benefit from the use of this material.

For the guidance of growers interested in this subject, we would offer the following advice:—Before purchasing lime for your land take a soil sample of your block and forward it to us for a test of its lime requirement. The sample taken should be representative of the soil on the block, and therefore a portion of the surface soil to plough depth should be taken at several points in the field, and the whole thoroughly mixed. A sample of this mixed soil of about 1 lb. weight should be placed in a suitable container labelled with the name of the grower. A note from the latter despatched at the same time as the sample should state that advice on the lime requirement of the soil is desired.

Growers in the Northern areas should forward their samples to the Chemist in Charge, Sugar Experiment Station, South Johnstone. Farmers in those districts south from Townsville should address samples and correspondence to the Director, Bureau of Sugar Experiment Stations, Department of Agriculture, Brisbane.

ANTS IN CANEFIELDS AND BUILDINGS.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report for the period of March to May, 1931, *from the Entomologist at Meringa, Mr. E. Jarvis:—*

THE name *ant* is sometimes applied erroneously to termites, which, although commonly called "White Ants," are not, however, related in any way to the Formicidæ, or true ants, these being mostly of small size, and when in the female or worker forms able to sting more or less severely.

Amongst the several hundred Queensland species only very few are known to cause annoyance to man, either by entering buildings or infesting the roots of cultivated plants. As a matter of fact, we cannot be said to possess even a single really aggressive species, such, for instance, as the dreaded "Fire Ant" (*Myrmica*

saevissima), whose sting has been likened to a stab from a red-hot needle, and which is known to completely undermine a whole village, finally compelling the inhabitants to desert it; or the celebrated "Driver Ant" (*Dorylus* sp.), which periodically turns people out of their houses at a moment's notice, while its passing hordes ransack every building, destroying all animals or insects which happen to be surprised or fail to decamp quickly enough.

Probably the most troublesome ant in Queensland at the present time is *Pheidole megacephala*, an introduced species which has become naturalised, and is known to occur also in Mauritius and elsewhere. Its presence in the Cairns district dates back to the year 1901, when it appears to have been already well established in cane-fields. This pest has exterminated many species of our native ants and other insects; and at Meringa I have found it invading the nests of little birds and killing the defenceless young ones just hatched from the eggs. Such facts serve to illustrate the possibilities that may result from the introduction of any insect which is able to exterminate in this manner numerous native species of the animal kingdom, the destruction of which cannot ultimately fail to exert an influence on the fauna and flora of the province invaded, thus upsetting to some extent the existing balance of nature.

Control Measures.

Certain ants have attracted more or less notice from growers, on account of their having been found nesting in considerable numbers amongst the roots of cane-stools. As a reply to various recent inquiries in this connection, the following additional information will doubtless be of general interest. The commonest species of those likely to infest cane-plants is an ant about 3/16ths of an inch in length, the entire body of which—including its long legs and antennæ—is of a uniform light yellow colour. Good results have been secured by saturating the nest of such insects with an emulsion prepared as follows:—

Dissolve three-quarters of a pound of soap in half a gallon of boiling water, and then add 1 gallon of kerosene, a little at a time, while violently churning the mixture until a creamy liquid is obtained; add to this three-quarters of a gallon of creoline, and churn well until mixed. When using this emulsion, dilute it to 2 per cent. with water, and apply at once to the nest. Another method is to remove the top soil around an affected stool to a radius of about 1 foot and a depth of 2 to 3 inches, and then substitute in its place some moist, sifted sand or earth, with which arsenate of lead has been thoroughly mixed at the rate of about 5 lb. to each bushel. For nests situated in headlands or near cane-stools, a 2 per cent. solution of lysol, or a 10 per cent. solution of cresyl, has proved satisfactory.

Non-poisonous Methods.

Lay pieces of sponge containing sweetened water in the runs of ants entering houses, and when swarming with them dip same into scalding water. Plates or pieces of flat tin, when smeared over with lard grease, attract these insects in great numbers; boiling water should be poured over these at intervals.

Substances which have been recommended as deterrents are powdered naphthalene, borax, cedar oil, tobacco dust, sulphur, pyrethrum, &c.; these should be scattered on floors or shelves at the points of entrance, or along the run-ways. Treatment of nests of *Pheidole* ants with hot water has been reported as successful in Africa; such work being carried out after the wet season when most of the ants are near the surface. In dealing with very large nests, these are exposed by removing the top soil and passing a painter's blow-lamp over the disturbed surface.

For many years past the present writer has protected hanging shelves—used for holding breeding-cages containing caterpillars and other living specimens—from invasion by ants by merely tying a small piece of cotton-wool tightly around the wire just above the shelf, and covering this and an inch or two of the wire above it with ordinary axle grease. Complete and permanent protection is afforded by this simple method, which, when applied to indoor shelves, will last for a year or more without needing to be renewed. To make tables ant-proof, the legs should be stood in shallow tins about 5 inches in diameter and 3 inches deep, which are then filled to a depth of about one-third with melted paradichlorobenzene. The volatile fumes arising from this chemical, being heavier than the air, will fill the tins and overflow same, creating a repellent atmosphere. The odour, however, is not pronounced enough to be objectionable to those in the house, and is not injurious to human beings. Liquid paradichlorobenzene crystallises into a hard mass in about half an hour, and evaporation can be greatly retarded by covering the surface with a layer of water, which soon becomes odorous enough to act as a repellent to ants attempting to cross the surface.

Fumigating Infested Soil.

Calcium cyanide has been advocated for fumigating the nests of ants in place of carbon bisulphide. Large nests situated on headlands, however, are best fumigated with carbon bisulphide, or by the arsenic-sulphur treatment. Calcium cyanide powder, blown into the nests by means of a foot-pump, has also proved an effective control measure. Ants are frequently destroyed in immense numbers by attracting them to trap-boxes containing decaying vegetation, which, later on, when infested with large nests or communities, can be fumigated with carbon bisulphide or treated with boiling water.

Some Effective Poison-Baits.

A simple poisoned syrup can be made from ½ lb. of sugar, 1 pint of water, 62 grains of sodium arsenite, and 1 dessertspoonful of honey. A few drops of this bait are placed on pieces of glass and laid in the run-ways.

Another good bait consists of the following ingredients:—Water, 1¾ pints; tartaric acid crystals, 30 grains; sodium benzoate, 45 grains; sugar, 2.2 lb.; honey, 3½ oz.; and sodium arsenite, 108 grains. This poison has proved very effective in Italy against the Argentine ant.

A formula which has given excellent results in France should be mentioned here. Take a solution of 473 parts (by weight) of white sugar, add 2 of sodium arsenite, 0.61 of tartaric acid, and a little sodium benzoate, and colouring matter. Boil this together in water, keeping up the amount of water as it evaporates to maintain a total of 1,000 parts by weight.

Poisoned Barriers.

Articles of furniture, such as dressers, tables, &c., can be protected from ants by fastening around the legs or other supports a piece of lamp-wick or tape about 1 inch wide which has been dipped into a strong solution of corrosive sublimate dissolved in methylated spirits and then dried. Ants will not attempt to cross this barrier, because of the risk of getting the minute crystals of this deadly poison on their feet. This method should not be used in houses where there are young children. A good way of making dining-tables ant-proof is to surround the top of each leg—in such position as will be out of sight—with a narrow band of tin, and smear the surface of same with ordinary axle grease.

PLATE 95.—NORTH COAST PINEAPPLES.

A fine consignment of Pines ready for the Southern market—average weight, 7 lb. Grown by C. H. Ham, North Arm, N.C.L.

FLAG SMUT IN WHEAT EXPERIMENTS, 1930.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

EXPERIMENTS on flag smut in wheat initiated in 1929 were continued during the 1930 season, at the Roma State Farm. The writer is indebted to the manager and staff of the farm for the provision of prepared lands, for assistance in all stages of the work, and for careful compilation of the records of field germination.

Of the four experiments, the first was a comparative failure on account of weather conditions as explained below. The remaining experiments confirmed and extended the results obtained in the previous season, points of greatest interest being:—

Bluestone treatment effectively controls seed-borne infection of flag smut without detrimental effect on the germination of the seed treated.

Copper carbonate dressing is not satisfactory for the control of this type of infection unless the quantity of smut spores on the seed is so small that they cannot be detected by the unaided eye. Results obtained by other investigators allow one to add that a similar rule could be applied in connection with the control of wheat bunt.

Varietal Susceptibility.

Experiment No. 1 consisted of trials of the susceptibility of the varieties shown to be more resistant in 1929 and of several others previously untested. Seed of these varieties was heavily infested with spores of the flag smut fungus, *Urocystis tritici*, and planted in four blocks. There was one row two chains long of each variety in each block. The order was randomised. The experiment was planted on the 7th and 8th of May in somewhat dry soil. The wheat was watered as planted to ensure germination. Rain fell immediately afterwards, and the wheat grew to maturity in spite of low soil moisture during the later stages and a severe rust epidemic. The percentages of plants developing symptoms of flag smut are given in Table I. It will be seen that the infection was low, Canberra averaging only 2·8 per cent. Consequently the results are of little value and no conclusions can be reached from the other low percentages except that the highest of them—Warren 1·9 and Sultan 2—indicate susceptibility in those two varieties. It is to be noted that there was no infection in the Sultan selection under the conditions of the experiment.

The low infection in spite of heavy seed contamination is explained by the relatively high temperatures during germination of the wheat. The average daily maximum temperature for the six days following planting of Experiment I. was 73 deg. Fahr. and the average minimum 55 deg. Fahr. These figures are considerably higher than those for Experiment II., where the average maximum was 69 deg. Fahr. and average minimum 39 deg. Fahr. for a similar period. In the latter experiment an average infection of 24 per cent. was obtained in the checks.

At low temperatures wheat germinates very slowly, the rapidity rising with rise of temperature till it reaches a maximum at 82 deg. Fahr.

Flag smut spores will germinate moderately well at low temperatures and reach a maximum at 64 deg. Fahr. Above this temperature their vigour of germination diminishes.

More rapid germination of the wheat or retarded germination of the flag smut spores gives the seedling a better chance of passing safely through the stage in which it is susceptible to infection. Within reasonable limits, therefore, rise in temperature gives lower infection of flag smut. This is of great interest in connection with the low incidence of the disease in Queensland as compared with the cooler Southern States.

TABLE I.

PERCENTAGE INFECTION.

Variety.	Block I.	Block II.	Block III.	Block IV.	Average.
Currawa	0	0	0	0	0
Canberra	0	3·1	2·8	1·6	1·9
Florence	0	0	1·3	1·6	0·7
B.F.G. 2628	0	0	0	0	0
C.C.C. 2702	0	0	0	0	0
Sultan	1·4	5·1	0	1·5	2
P.I.P.M. 2612	0	0	0	0	0
Canberra	2·8	4·6	1·5	3·4	4·1
Waterman	0	0	1·6	0	0·4
Waratah	0	1·3	1·7	0	0·7
B.I.P.M. 2617	0	0	0	0	0
B.I.P.M. 2615	0	0	0	0	0
Warren	0	2·5	5·1	0	1·9
Bunge No. 1	0	0	0	0	0
Canberra	1·6	1·4	4·4	0	1·8
B.I.P. 1301	0	1·6	0	0	0·4
B.I.P.M. 2604	0	0	0	0	0
Warchief	0	0	0	0	0
B.F.G. 2627	0	0	1·4	0	0·3
B.I.P.M. 2610	0	0	0	0	0
B.I.P. 1346	1·6	0	0	2·9	1·1
Canberra	1·4	9·2	4·6	3·2	4·6
B.F.G. 2703	0	0	0	1·6	0·4
Roma Red	1·4	0	1·4	0	0·7
Sultan Selection	0	0	0	0	0
Nabawa	0	0	0	0	0
B. Man. 33	1·1	0	0	0	0·3
B.I.P.M. 2602	0	0	0	0	0
Canberra	4·1	0	0	3·2	1·8
B.I.P.M. 2704	0	0	0	0	0
					0·19
Canberra, Average	..	..	..	..	2·8

Seed Treatment.

Experiments Nos. II., III., and IV. were trials of various seed treatments. Seed infested with Flag Smut was treated and planted and the germination and development of smut noted. For Experiment II. the seed was heavily infested by shaking with Flag Smut spore material at the rate of approximately 1 lb. per bushel, for Experiment III. the seed was shaken with spore material at the rate of 2 oz. per bushel, and for Experiment IV. at the rate of ½ oz. per bushel. The spore material on the latter could only be detected with difficulty, though

careful examination with a lens revealed numerous spores on each grain of wheat. In Experiment II. treatments with Bluestone, Bluestone followed by Lime, Hot Water, and Copper Carbonate dust were tried. In Experiments III. and IV. only Bluestone and Copper Carbonate treatments were used. The details of treatment are as follows:—

Bluestone.—The seed was immersed for three minutes in a 1½ per cent. solution of Bluestone, then drained and dried.

Bluestone—Lime.—The seed was immersed in Bluestone as above and then immersed for three minutes in a 1 per cent. suspension of slaked lime in water before being allowed to dry.

Hot Water.—The seed was soaked in water for four hours and was then immersed for ten minutes in a water bath maintained at a temperature of 129 deg. Fahr. with constant stirring. It was then quenched in cold water, drained, and dried.

Copper Carbonate.—The seed was shaken with Copper Carbonate dust at the rate of 2 oz. per bushel.

All treatments were carried out ten days before planting. The seed was planted in four blocks of randomised rows.

These experimental plots were first planted on 12th May, using Canberra wheat, but, owing to the destruction of a large number of the plants by birds, the planting was duplicated later, using Watchman seed. The accompanying germination results are of this second planting. The hot water treatment was the only one to significantly reduce germination, though both Bluestone and Bluestone and Lime delayed it slightly. Tables II., III., and IV. show the germination in Experiments II., III., and IV. respectively. Table V. shows the infection in these experiments.

TABLE II.

PERCENTAGE GERMINATION.

Treatment.	Block I.	Block II.	Block III.	Block IV.	Mean.
Bluestone	78	85	90	93	86·5
Bluestone and Lime ..	84	93	87	90	88·5
Untreated	71	84	82	89	81·5
Free Untreated	69	78	89	87	80·75
Hot Water	43	56	52	58	52·25
Copper Carbonate ..	79	84	84	83	82·5
Untreated	74	79	86	88	81·75
Block Means	71·14	78·86	81·43	84	79·11

Variation.	Degrees of Freedom.	Sum of Squares.	Variance.
Within Treatments	21	777·81	..
Between Blocks	3	649·71	..
Random	18	128·10	7·116

Standard error of comparison of two treatment means $= \sqrt{\dfrac{7 \cdot 116 \times 2}{4}} = 1 \cdot 886.$

A difference of 5 percentage germination would indicate odds 20 : 1 for significance.

TABLE III.

PERCENTAGE GERMINATION.

Treatment.	Block I.	Block II.	Block III.	Block IV.	Mean.
Bluestone	87	85	85	87	86
Copper Carbonate ..	86	83	86	91	86·5
Untreated	77	85	83	89	83·5
Block Means	83·33	84·33	84·67	89	85·33

Variation.	Degrees of Freedom.	Sum of Squares.	Variance.
Within Treatments	9	118	..
Between Blocks	3	56·64	..
Random	6	61·36	10·226

Standard error of comparison of two treatment means $= \sqrt{\frac{10{,}226 \times 2}{4}} = 2{\cdot}26$. A difference of 5·5 in percentage germination would indicate odds 20 : 1 for significance.

TABLE IV.

PERCENTAGE GERMINATION.

Treatment.	Block I.	Block II.	Block III.	Block IV.	Mean.
Bluestone	87	91	87	83	87
Copper Carbonate ..	92	87	82	87	87
Untreated	90	84	83	83	85
Block Means	89·6	87·3	84	84·3	86·3

Variation.	Degrees of Freedom.	Sum of Squares.	Variance.
Within Treatments	9	116	..
Between Blocks	3	64·65	..
Random	6	51·34	8·557

Standard error of comparison of two treatment means $= \sqrt{\frac{8{,}557 \times 2}{4}} = 2{\cdot}066$. A difference of 5 in percentage germination would indicate odds 20 : 1 for significance.

TABLE V.

PERCENTAGE INFECTION.

Treatment.	First Sowing, Canberra.*					Duplicate Sowing, Watchman.				
	Block I.	Block II.	Block III.	Block IV.	Average.	Block I.	Block II.	Block III.	Block IV.	Average.
Experiment II.—										
Bluestone	0	0	0	0	0	0	0	0	0	0
Bluestone and Lime ..	0	0	0	0	0	1·3	1·1	0	1·1	0·9
Untreated	21·4	32·5	40	21	28·7	26·7	19·7	26·7	15·8	22·2
Free Untreated	0	0	0	0	0	0	0	0	0	0
Hot Water..	0	0	0	0	0	0	1·8	0	0	0·4
Copper Carbonate.. ..	0	3	0	0	0·8	7·6	3·6	4·8	6	5·5
Untreated	15·7	18·1	24·4	18·5	19·2	16·2	31·8	12·1	10	15
Experiment III.—										
Bluestone	0	0	0	0	0	0	0	0	0	0
Copper Carbonate.. ..	0	0	0	0	0	0	1·1	1·1	1·1	1
Untreated	4	10·3	0	0	3·8	2·6	5·9	8·4	3·4	5·1
Experiment IV.—										
Bluestone	0	0	0	0	0	0	0	0	0	0
Copper Carbonate.. ..	0	0	0	0	0	0	0	0	0	0
Untreated	4·5	3·2	0	0	1·9	1·1	0	2·4	3·8	1·8

* Bulk of plants destroyed by birds.

Consideration of the infection taking place leads to the following conclusions:—

Bluestone effectively controls seed-borne infection of Flag Smut.

Treatment of seed with *Lime after Bluestone* is liable to impair the effectiveness of the Bluestone.

Hot water did not show its usual complete control, as one plant in one of the hot water rows was infected. It seriously reduced germination, and is impracticable as a method of control.

The most interesting results are found in the treatments with *Copper Carbonate*. The standard dressing with this dust completely controlled infection in the lightly infested rows, but permitted some small infection in the rows planted with seed with medium infestation and quite considerable infection from heavily infested seed. This correlates well with the previous season's results when only heavily infested seed was used and the conclusion was reached that copper carbonate dust is not satisfactory for treating Flag Smut-infested wheat.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

OUTLINE OF APIARY INSPECTION IN THE BRISBANE AND ADJACENT DISTRICTS.

By HENRY HACKER, Entomological Branch.

IT might be mentioned, by way of introduction, that an apiary badly affected with American foulbrood was reported early this year from the Pine River district. As soon as the disease was definitely diagnosed the entire apiary, consisting of twenty-five colonies, was destroyed by burning.

As a result of this infestation it was thought advisable to make a survey of the apiaries situated within about fourteen miles of Brisbane. In the north a little wider area was included, embracing the Petrie and Samford districts. All the apiaries that could be found within this area have now been carefully examined and no trace of infectious disease has been found.

Altogether 116 apiaries, totalling 2,024 colonies, have been visited. These are owned by 107 beekeepers. There are probably others who have been overlooked owing to their addresses being unknown.

Eight people keep but a single hive merely to provide honey for the household or as a subject of nature study. On the other hand, several beekeepers own over 100 colonies which are distributed in several different localities. Some farmers also keep a few colonies and add to their incomes to some extent in this way.

Grading of Apiaries.

During the inspection work the general condition of the bees, equipment, &c., at each apiary was noted, and roughly classified into four grades; it is also a classification of the beekeeper as reflected by the condition of his apiary.

Excellent.—Standard frame hives well painted; colonies of even strength, with Italian queens. Apiary well equipped, bearing evidence of good management and the bees of good attention.

Although only a few of the apiaries came up to this high standard, a number classed as good would have fulfilled the conditions if the few weaker colonies were built up to uniform strength.

Good.—Standard frame hives. Colonies often of uneven strength and demanding more attention; the queens sometimes of uneven quality.

The beekeepers in this grade generally have a liking for bees and are keen to adopt any methods likely to increase their yield of honey. Pressure of other work is generally the cause of any neglect that the bees exhibit. The largest proportion of the apiaries examined belong to this grade.

Fair.—Frame hives roughly made with odd-sized timber, or fruit cases adapted, generally containing hybrid bees. With a little advice and assistance, many in this grade would soon qualify as good.

Bad.—Box hives, or frames in old and badly fitting boxes, the frames being unwired, badly spaced, and stuck together. Hybrid bees generally obtained from trees in the bush.

With bees kept under these conditions it is impossible to remove the frames without breaking them. The owners show very little interest in their bees and seem satisfied with small quantities of inferior honey. The proportion of apiaries included in this grade was small.

Diminishing Yields in the Brisbane District.

Many beekeepers state that their locality is yielding smaller quantities of honey year by year. This is chiefly owing to the destruction of trees due to the inevitable growth of the city, especially in the outer suburbs. Flower gardens, though of no use to the bee farmer on a large scale, help the town dweller with his one or two hives, but it takes a large area of plants to provide a really adequate supply.

Another reason for the diminished yield is the fact that since the original beekeepers settled in their localities others have encroached on their foraging grounds, with the result that the average returns per colony are now lower.

The weak condition of many colonies early in the year was very noticeable. The long dry spell at Christmas, causing a honey and pollen famine, was probably the chief cause, although in some instances the weakened state was probably brought about by over extracting. Many colonies were reduced to a handful of bees clustered on a few inches of brood. Immediate feeding was recommended where there were no colonies strong enough to have honey or brood comb to spare for the weaker ones.

Brisbane District Overstocked.

The total number of colonies within this area is greater than was expected and even the more favourable localities appear to have too many beekeepers congregated upon them, with the result that the apiaries cannot expand sufficiently to become their sole occupation. Speaking generally, the area under review may be considered more than fully stocked, and the prospective beekeeper would be well advised not to attempt commercial beekeeping within fifteen to twenty miles of the city, but rather to go further afield where vast areas of bee pasturage are at present unoccupied, providing more scope for future expansion and much better prospects of success.

Caboolture, Nambour, and Yandina Districts.

The inspections carried out in these districts were not so intensive as the Brisbane survey, only a certain proportion of the apiaries being examined. No case of foulbrood had been recorded from the Caboolture, Nambour, and Yandina districts, hence an intensive survey was not called for. All the colonies were found to be healthy and were generally in a stronger condition than those in the metropolitan areas. This was due to a good flow from the tea-tree, accompanied by mild weather during the period of inspection.

No Further Cases of Foulbrood.

It is gratifying to state that no further outbreaks of foulbrood have been discovered and it is hoped that the disease has been eliminated from Queensland, at any rate for the present.

DISEASES OF THE PIG.*

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

[*Continued from the April issue.*]

PART V.

In the preparation of information dealing with Diseases of the Pig, an endeavour has been made to describe in the simplest language possible the various conditions, abnormal and otherwise, associated with the incidence or appearance of disease in swine. The suggested preventive measures and methods of treatment are such as may be successfully carried out by any careful farmer, excepting only in cases where the services of a qualified veterinarian are advised, and in these cases the best methods to follow will be suggested on the spot by the surgeon himself.

The pig is notoriously a bad patient and a difficult animal to handle when indisposed, hence great stress has been laid throughout this treatise on the necessity of preventive measures, for prevention is not only much better than cure, but is invariably less costly and a great deal more satisfactory.

In dealing with methods of treatment and the engagement of qualified aid, it has been realised there are numerous difficulties in the way, because Departmental officers or practising veterinarians are not always immediately available in town or country districts. Again, therefore, we stress that prevention is better than cure, and we might even qualify this further by adding prevention is more necessary than cure.

Mr. Shelton's bulletin, representing as it does much labour and the fruits of careful study and observation, is a welcome contribution to current pig literature.—EDITOR.

SUNBURN OR SUNSCALD.

THIS is, strictly speaking, not a disease. It is simply due to the effects of the sun on the tender, somewhat unpigmented skin of the pig. White pigs, being unprotected with pigment, invariably suffer more than black or red pigs, and a badly sunburnt pig, particularly if his ears have been frost bitten, is a difficult patient to treat. Pigs need protection from the effects of the weather. For hot climates white pigs that have a comparatively thick coat of hair should be selected, the soft-skinned, light-coated types are quite unsuitable. The symptoms of sunscald are that the skin cracks and burns, and the scabs or scars attract and become covered with dirt. Treatment must be both preventive and curative and must first aim at removing the cause. The pigs must be housed in a clean, comfortable, well-protected sty or a shady yard. They should be carefully washed with warm soapy water and after drying should be oiled with carbolised vaseline, petroleum

* The typescript and illustrations of the Farmers' Bulletin on Diseases of the Pig have been submitted to the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., Department of Agriculture and Stock, Brisbane, Queensland.

Copies of the Bulletin when completed may be had gratis on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

In the compilation of this paper the writings of recognised authorities in other States and other parts of the world have been drawn on, and the assistance thus received, also that freely given by other Departmental officers, is acknowledged gratefully.

jelly, or coconut oil, to soften, cleanse, and heal the skin. The use of a mixture of kerosene and fat, though crude and sometimes effective, is not by any means a reliable skin emollient. It will, of course, be necessary in treating stock to keep the pigs under sanitary conditions and to give them ample nourishing foods.

Only such stock as are suited to the climatic conditions should be kept. It would not be correct to say that white pigs are unsuitable for hot, dry districts, or the more humid districts of the North, for white pigs can live and do well in any district, provided they have the necessary care and attention. They certainly cannot stand the rougher or more exposed conditions that black and red pigs endure.

It does happen occasionally that pigs grazing on a crop of rape, particularly when it is wet after heavy dew or rain, will develop a rash, more or less acute, on their ears and shoulders, their snouts may also become inflamed. This is usually more noticeable in white or red pigs than in black pigs. It is, however, of a temporary nature only, except where accompanied by lice irritation and frost-bitten ears.

It is not good practice to allow pigs to graze too long in paddocks that become soft and slushy with rain. They should be turned on to drier ground and the food be carted to them until the weather clears up.

PLATE 96.

Fig. 1.—Inflammation of the sheath in a young boar pig. This is a fairly common trouble in male pigs under twelve months of age. Careful massage of the parts to remove accumulations of urine followed by thorough cleansing of the surrounding areas is advised. During treatment the affected animal should be kept away from other stock in a clean, dry sty, and be fed liberally on nourishing foods of a laxative nature.

Abscess Formation.

Pigs of all ages occasionally suffer from one or other form of abscess, which may be the result of internal ailments or be due to local causes. Such abscesses usually burst and discharge their contents in the form of pus. But in other than very young animals the skin is often so tough that the abscess will not point, and the pus gravitates to the lower levels of the affected part.

Apart from internal abscesses due to tuberculosis, parasites, &c., most of the external abscesses to which the pig is subject are due either to splinters of wood, grass seed, or to old sores that have improperly healed. The largest abscesses usually result from improper castration.

Symptoms.—The abscesses are usually either in the form of a lump slowly developing or the fully developed boil, ready to burst or already having burst. They may appear on any part of the body. A common form of abscess is that in which a bite from another pig becomes inflamed and septic (the ear being a common seat of this trouble), enlarges considerably, and becomes infiltrated with pus. The pain due to pressure causes the pig to carry its head on one side. A similar condition may also be brought about by infection from the throat gaining access to the middle ear, through the eustachian tube. Abscesses causing great pain and loss of condition may result in death.

Abscesses are also frequently formed between the digits and in such cases the foot will be much enlarged. In young boars, the sheath is a common site of trouble. (See fig. 1.) Abscesses which involve the

PLATE 97.

Fig. 2.—Abscessed areas resulting from infection following improper castration. This pig had been castrated several weeks before this photograph was taken; the abscess had been developing, and meantime the animal suffered great pain though, strangely enough, he continued to thrive, though growth is always slower in cases like this than with normal pigs.

scrotum or purse are the result of improper castration, the pus from which may infiltrate the tissues immediately surrounding the operation wound. (See fig. 2.)

Treatment.—The first step to be taken must be to ascertain the cause which will be largely determined by the situation of the abscess. The affected area should be thoroughly washed with warm water to which disinfectant has been added, and then the fingers should be carefully passed over the area in an effort to discover a soft spot.

When this has been found, and if it appears to yield under slight pressure, it should be lanced with a clean sharp knife that has previously been placed in methylated spirit. Care must be taken to lance the

abscess in such a position that the discharge will drain away freely from the opening. The cavity should then be cleaned out by means of a small household syringe and disinfectant solution and the wound wiped dry, after which boracic powder or Calvert's disinfectant powder may be dusted on. In order to assist the abscess in pointing, the enlargement may be painted with liniment of iodine.

If the abscess has not developed a soft spot it should be watched carefully for a few days. In the case of abscesses resulting from improper castration, the opening must be made well down under the affected area so that all the pus may readily drain clear. The cavity should be washed out daily and massaged well in order to ensure the expulsion of pus, and plenty of dry boracic powder or Calvert's disinfectant powder be applied to keep the wound free from flies.

PLATE 98.

Fig. 3.—Another case of abscess formation, the result of infection. The abscesses in this case had broken out and were suppurating an evil-smelling pus. Abscessed areas like this take months to clean out and heal up. They can be prevented by following proper methods in the operation of castration.

Pyaemia.

Pyaemia, or the formation of multiple abscesses, is a term used to indicate that abscesses have formed in different parts of the body of the affected pig, and that once having originated they are liable to spread from one part of the body to another by metastatic action. Pyaemia is really a form of blood poisoning (septicæmia)), though it is not usually so severe as in those cases in which the animal has become weakened by continued illness.

In animals that are otherwise healthy and in good condition, pyaemia is a very rare disease. It usually finds its best host in the sickly, half-starved, hidebound animal, whose powers of resistance have been lowered by starvation and who is not able to battle against illness.

Pyaemia is essentially a germ disease, and treatment must aim at cleansing the blood and putting the animal in first-class condition. There is no other recognised treatment, but preventive measures, if adopted in time, will do much to restore the animal to normal condition.

The carcase of a pig suffering from pyaemia would be totally condemned by the meat inspector.

Treatment of Wounds.

A clean incised wound made by a sharp instrument needs little other attention, if kept clean, than painting with tincture of iodine. If necessary it may expedite healing if one or two stitches are inserted in the wound to prevent the parts sagging open. Do not wash such a wound too much, as this prevents healing; boracic acid and a little iodoform may be dusted on to keep flies away.

PLATE 99.

Fig. 4.—Nipping off the sharp, black, "needle" teeth of sucking pigs prevents a great deal of trouble resulting from laceration of the lips and tongues of the litter mates during meal times when the suckers fight for their place on the teats. It also prevents injuries to the sow's udders and teats, and is beneficial in every way without injuring the young pigs from whom the sharp teeth are removed. The teeth should be cut back close to the gums when the suckers are a day or two old. Paint the gums with a dilute solution of tincture of iodine before releasing the animal.

Jagged, Torn, or Punctured Wounds.

Jagged, torn, or punctured wounds caused by the animal coming into contact with stakes, nails, barbed wire, &c., cause more trouble, for there is generally a quantity of dirt embedded in the tissues that needs careful syringing and draining out. First trim up the wound by cutting off with a pair of sharp scissors any portions of skin projecting into the wound, also clip the hair around the area. Then carefully wash with a solution of hycol, condy's crystals, or other disinfectant. It is very necessary to be certain that the wound is thoroughly cleansed inside and that healing takes place there before surface healing.

When quite clean dust on boracic acid and iodoform, equal parts, or apply zinc ointment. The use of dry dressings subsequently instead of wet lotions promotes healing. Dry dressings also protect the wound, and should be continued until the wound has healed and cleared up. The floors of the sty and the surroundings generally should be kept scrupulously clean.

Necrotic Ulcers.

This trouble, also referred to in some publications as necrotic rhinitis, necrobacillosis, bullnose, ulceration, &c., indicates a diseased condition of the skin and flesh on one or other portions of the body, and the sloughing or decaying off of portions of the tissue. It is not common in well-kept pigs, though the formation of ulcers that are difficult to heal or treat are noted now and again. The condition described as necrobacillosis results from infection by the germ technically known as "Actinomyces necrophorus." The germs enter by way of wounds or other injuries caused by fighting (particularly in very young pigs) or by mouth, lip, or tongue injuries caused by rough, sharp bones, glass, or other objects in the food. The disease sometimes localises itself in the skin, and in this case, of course, treatment would be different to that where the mouth and lips are injured.

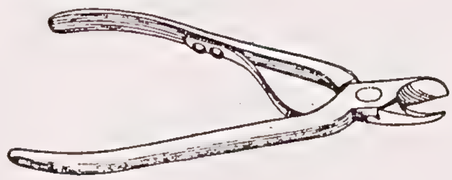


PLATE 100.

Fig. 5.—Tooth nippers of this description are advised for use in the operation referred to in fig. 4. They are not expensive and will last a long time if carefully handled, wiped dry, and rubbed over with an oily cloth before putting away.

In some instances it has been noted that a similar condition attacks very young pigs before weaning. Scabs occur on the cheeks and gradually spread up and over the head. The eyelids close, and there is a discharge. The hair loses its lustre, the animal mopes, and dies in about ten days. Sometimes the face is eaten away until the bone shows and becomes fly-blown. In these cases it is evident the pig's face has become infected with bacillus necrosis, this bacillus eating its way into the parts. The probability is that the pigsties would become infected by diseased pigs, hence in handling the trouble it is better to immediately kill off and burn the affected animals. Dressing the wounds with a 2 per cent. solution of lysol (teaspoonful to a pint of sterile water) is advised, as also painting with tincture of iodine. Attention to the general health of the animal, isolation of affected stock, and general sanitary measures are advised. For application to the open wounds a mixture of twenty parts of glycerine and one part of carbolic acid or a dilute solution of iodine is helpful.

Swine Erysipelas.

This disease is not common in Australia, but in some parts of the world is a source of considerable trouble. Mr. G. A. Goodchild, in a recent issue of the Journal of the Large Black Big Society, stated that "far greater confidence would be placed in (English) pig breeding were it not for the elusive disease erysipelas, which causes greater loss in the eastern counties of England than all other diseases combined."

This is not the trouble here, though a few notes will be of interest. The disease is due to a specific bacillus. In Great Britain, as a rule, the disease attacks fat pigs and usually in the summer months, though under favourable weather conditions it may also appear at any season of the year.

The disease is one that should be attended to by a competent veterinarian. It attacks adult pigs more so than young stock. There are no definite or reliable symptoms that would indicate to the layman the occurrence of this disease. Microscopic examination of the blood of an infected animal would be necessary. The disease is sometimes mistaken for swine fever, the discoloration of the skin being the lesion resembling the latter disease. In a skin disease of this description diamond-shaped red discolorations are more diagnostic of swine erysipelas than swine fever or swine plague.

Preventive treatment overseas is almost entirely vaccination. An immunising serum may be used in the prevention of the trouble with considerable success. Swine that recover from an attack of swine erysipelas are often immune from future attacks.

A local disease in pigs, sometimes referred to as diamond spot disease, is probably due to digestive disorders, to infestation by ringworm, lice, or perhaps to the use of sawdust, shavings, or other dusty bedding.

Hide-bound.

This trouble indicates lack of vigour and an unhealthy condition of the blood. It results from indigestion, anæmia, general weakness, and is indicated by a peculiar harsh, dry condition of the skin, which may be covered with greyish scurf. In such cases the urine of the animal is highly coloured, is scanty, and contains crystals of a chemical substance known as oxolate of lime. The trouble is exaggerated by irregular feeding, improper foods, non-assimilation of the food, or by feeding on foods containing too high a percentage of sugar; constipation and a feverish sickly condition often accompany the trouble.

Treatment.—Aim at relieving the digestive troubles by changing the food to a light laxative diet with ample green food. Give occasional doses of Epsom salts (use 3 oz. each dose for a full-grown pig, and add an ounce or two of flowers of sulphur). Wash the pig frequently, and keep the skin well oiled. It is suggested that one part of flowers of sulphur to twenty of coconut oil will be a good mixture, once the cause of the trouble has been removed. Give the animal plenty of exercise and fresh water, with dry comfortable quarters to sleep in and a small ration of coconut or linseed oil cake in his food.

Wrinkles in the Skin.

The appearance of wrinkles or creases along the side, back, or neck of the pig does not necessarily indicate a diseased condition of the skin. Male pigs, as they develop age, develop wrinkles. This is often also the case in old sows, especially if they are in low condition. Development of wrinkles is also possibly largely due to hereditary or constitutional predisposition, and can only be overcome by improved breeding, selection, and better methods of feeding. Wrinkles may develop in cases where an animal is suffering from anæmia and debility, and in these cases must, of course, be looked upon more as a symptom than a disease.

Wrinkling and hardening of the skin and the development of a very heavy "shield" on the neck, shoulder, and side of aged boars is common. It is objectionable, and cannot be entirely prevented, though its development may be checked by constant oiling and softening of the skin, and by keeping the animal free from parasites.

It is important that exhibitors of show pigs should note this point.

[TO BE CONTINUED.]

PASTURE IMPROVEMENT.

THE Minister for Agriculture and Stock (Hon. H. F. Walker) announced recently that a Pasture Improvement Committee had been appointed, consisting of Messrs. E. Graham, Under Secretary, and Director of Marketing (Chairman); H. T. Anderson, representing the Council of Agriculture; F. F. Coleman, representing the Department of Agriculture; W. T. Harris, representing the Australian Dairy Council; and B. Shearer, representing the A.C.F. and Shirleys, Limited, and Nitrogen Limited.

At the committee's first meeting it was decided to carry on the experiments laid down in 1930 at Sherwood and Maleny, also to arrange for a further series of experiments in the South Coast districts near Nerang and Beaudesert, three or more experiments to be carried out on the Caboolture-Kilcoy line, and others near Eumundi and Green's Creek, near Gympie. Arrangements are also being made for an experiment in the Murgon district.

The idea in each instance is to make the most of young and short grass which is now accepted as of much better feeding value than grass that has begun to produce flowering stems, as young grass provides a ration that favours milk production and growth generally, against old grass which, in some cases, barely provides for maintenance. Rotational grazing is therefore recommended and the application of a sufficient quantity of suitable fertilizers.

In many of our coastal districts dairymen have found it impossible to establish suitable clovers. In some cases clover seed was sown on a dense mat of long, coarse grass. In other cases the application of small quantities of superphosphate was relied on to produce clovers that had never been sown.

Rotational Grazing.

It is realised that grass is the cheapest food for stock and that it is worth while, by the use of efficient harrows or other implements and the application of fertilizers, to endeavour to extend the grazing period by bringing in grass earlier in the spring and later during the early cold weather. Fertilizers have done this where the land has been thoroughly cleared up before their application—that is to say, the land had been thoroughly harrowed and brought, as far as possible, into the condition that would occur if it had been closely grazed and all droppings spread. To get the fullest effect it is essential that the paddocks be arranged in such a manner as to permit of rotational grazing. This insures the milkers being fed on young growing grass during the extended grazing period.

In order to keep some check on actual production as far as possible, calculations will be made on the following basis:—The number of cows grazed, multiplied by the number of days, and divided by the number of acres.

At Mr. W. S. Conochie's farm, Brooklands, Sherwood, the fertilizers were applied during the last week in August, paddock No. 1 receiving 1½ cwt. sulphate of ammonia and 2 cwt. superphosphate per acre, and in the period from 13th September to 19th November this paddock gave 152.2 cow-days per acre and 39.1 dry-stock days per acre, or a total grazing per acre of 191.3.

In the second paddock, an application of 1 cwt. sulphate of ammonia and 2 cwt. of superphosphate was made, giving 125 cow-days per acre, 45 dry-stock days, and total number of grazing days, 170.

In the third paddock, with an application of 2 cwt. of superphosphates per acre only, the result was 121.2 cow-days, 40 dry-stock days, and a total of 161.2 grazing days.

Paddock No. 4, with an application of 1 cwt. sulphate of ammonia, 2 cwt. of superphosphate, and ¾ cwt. muriate of potash, gave 158.3 cow-days, 52.5 dry-stock days, and a total of 210.8 grazing days.

Paddock No. 5, without fertilizer, gave 64 cow-days, 42 dry-stock days, and a total of 106 grazing days.

A.—Without Fertilizer.

PLATE 101.

PADDOCK No. 1.—Showing Growth after First Grazing.
1½ cwt. Sulphate of Ammonia and 2 cwt. Super. per acre.
Fertiliser applied 27th August, 1930.
Photo. taken 22nd October, 1930.

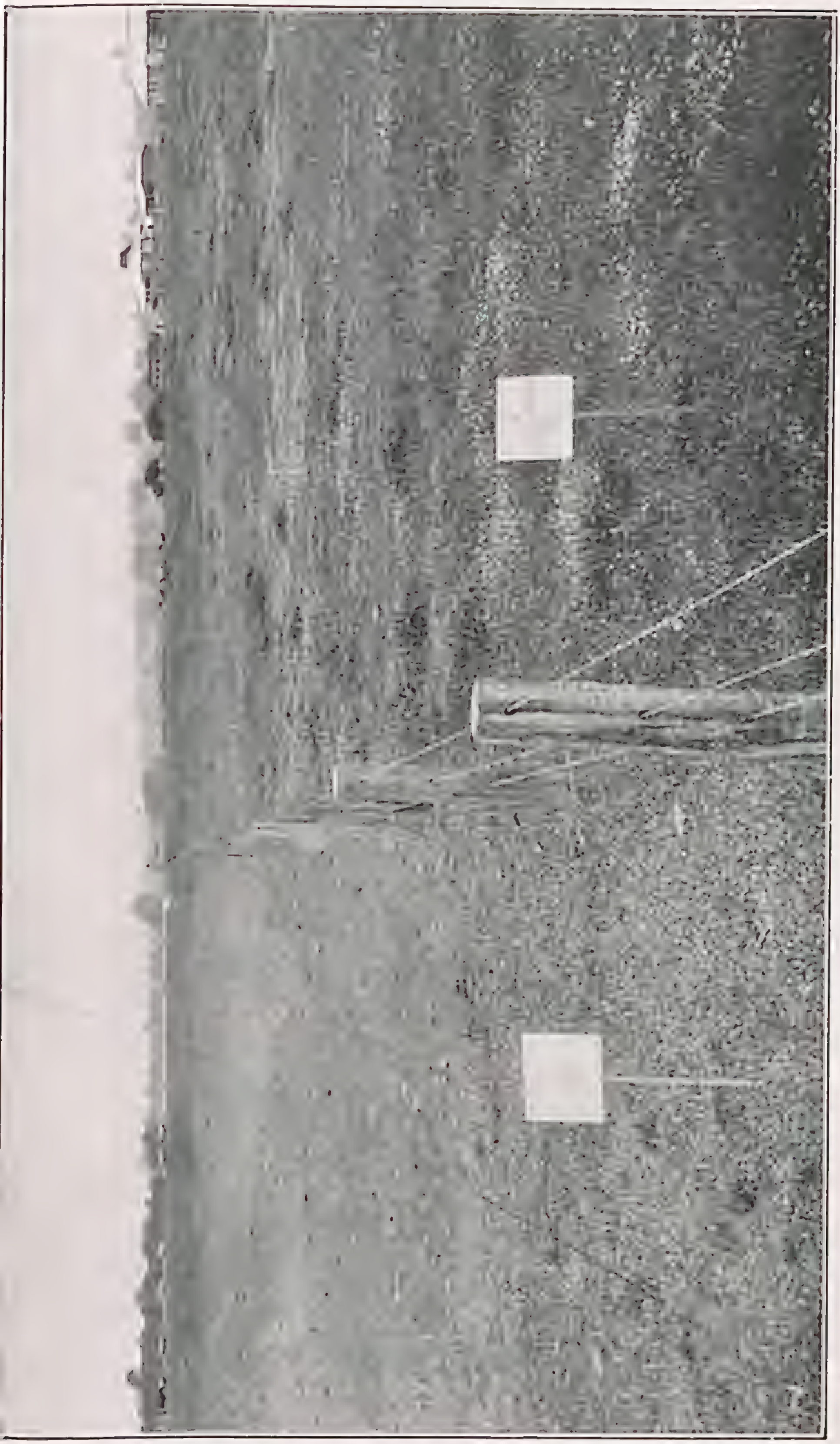


PLATE 102.

PADDOCK No. 3.—Showing Growth after First Grazing.
2 cwt. Super. per acre.
Fertilizer applied 28th August, 1930.
Photo. taken 22nd October, 1930.

PADDOCK No. 2.—Showing Growth after First Grazing.
1 cwt. Sulphate of Ammonia and 2 cwt. Super. per acre.
Fertilizer applied 27th August, 1930.
Photo. taken 22nd August, 1930.

The question of animal preference must not be overlooked. It was found on the gates being left open that the animals gave a decided preference to the nitrogen-treated paddocks. In the case of the paddock treated with superphosphate only and one without any fertilizers, the animals invariably chose the one top-dressed with superphosphate. This occurred when the gates of the nitrogen-treated paddocks were kept shut. No. 1 paddock, after being shut up for sixteen days, gave 60.9 cow-days per acre on first grazing. On the same basis, No. 2 paddock was shut up for twenty-three days and then gave 75 cow-days per acre at the first grazing. No. 4 paddock was shut up for thirty-one days, and then gave 83.3 cow-days per acre on first grazing, and paddock No. 3, after being closed for forty-one days, gave 90 cow-days per acre on first grazing, and the paddock to which fertilizer was not applied, after being closed for fifty-one days, only gave 64 cow-days per acre.

As regards earliness of bite, paddocks 2 and 4 can be considered as equal. No. 1, however, owing to the additional quantity of ammonium sulphate, gave the first grazing, and No. 4 gave the highest number of total grazing days—practically double that of the area without fertilizers and a great increase over the superphosphate-only paddock. The increases in both Nos. 1 and 2 over the superphosphate-only paddock are also significant.

Feeding Value.

Fair average samples, representing the different paddocks, were cut during September and October. These were analysed by the Agricultural Chemist, Mr. J. C. Brünnich, with the following results (dry-basis analysis):—

SHERWOOD.

—	—	—	Crude Protein.	Crude Fibre.
15th Sept. ..	Paddock No. 1 ..	Clover only	29·9	16·9
15th Sept. ...	Paddock No. 1 ..	Grass only	18·5	21·1
16th Oct. ..	Paddock No. 1 ..	Composite sample	20·1	26·3
16th Oct. ..	Paddock No. 2 ..	Composite sample	24·6	23·2
15th Sept. ..	Paddock No. 3 ..	Composite sample	25·2	21.3
15th Sept. ..	Paddock No. 4 ..	Clover only	27·4	20·6
15th Sept. ..	Paddock No. 4 ..	Grass only	22·9	23·3
16th Oct. ..	Paddock No. 4 ..	Composite sample	22·7	23·5
16th Oct. ..	Paddock No. 5 ..	Composite sample	19·2	26·9
15th Sept. ..	..	Grass in seed head, not eaten by stock	7·0	32·6

This table should be read in conjunction with previous paragraphs setting out dates of grazing and number of cow-days per acre.

MALENY.

—	—	Crude Protein.	Crude Fibre.
13th Dec., 1930 ..	Paspalum and other grasses in seed head, neglected by stock.	9·2	34·8
13th Dec., 1930 ..	Grass only from paddock top-dressed with 1 cwt. sulphate of ammonia and 2 cwt. superphosphate per acre during last week of October. This paddock should have been grazed about 10 days sooner.	17·2	25·2

It is significant that Mr. Webster, of Maleny, writing after the first good rain, states that he put fifty-seven head into the ammonium sulphate-superphosphate paddock, and it carried them for seven days (area, 2½ acres); further, he was considering the purchase of a horse mower as the grass was coming on so fast he could not keep it down.

Winter Feed.

The committee quite realises that, although it is possible to extend the growth of Paspalum before the cold weather sets in and to bring in the same grass earlier in the springtime, there still remains a gap to be filled. Endeavours, therefore, are being directed to the introduction of suitable strains of grasses and clovers that

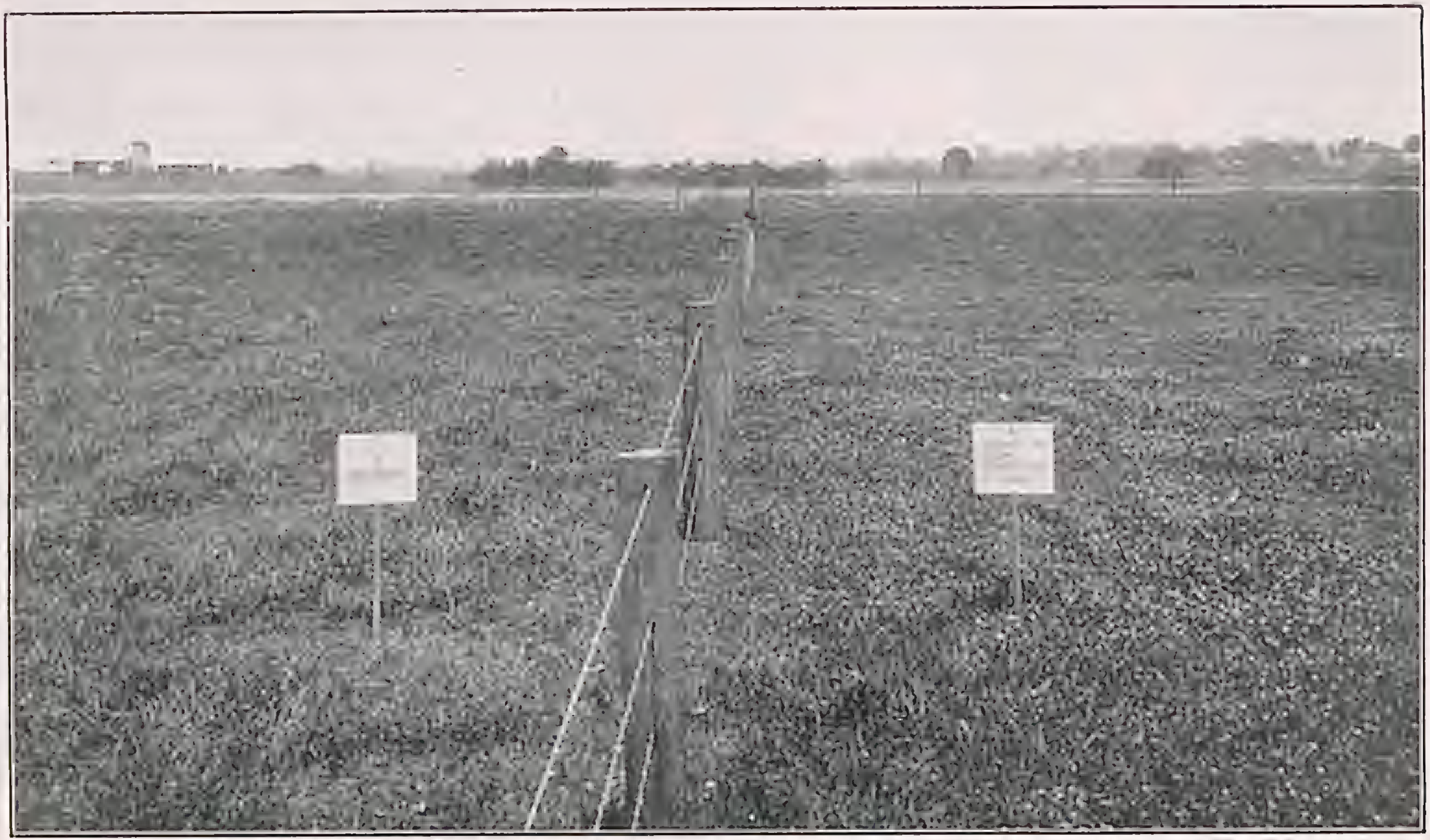


PLATE 103.

PADDOCK NO. 5.—Showing Growth.
Without Fertilizer.
Photo. taken 22nd October, 1930.

PADDOCK NO. 4.—Showing Growth after First Grazing.
1 cwt. Sulphate of Ammonia, 2 cwt. Super, and
$\frac{3}{4}$ cwt. Muriate of Potash, per acre.
Fertilizer applied 28th August, 1930.
Photo. taken 22nd October. 1930.

can be relied on to give winter feed, in particular such grasses as Perennial Rye Grass, Cocksfoot, and what is now called *Phalaris tuberosa* (Perennial Canary Grass). The importance of strain in these grasses is not being overlooked, as it is considered that the repeated failure to establish such growth in Queensland is not altogether due to the climatic conditions but may be principally put down to the commercial strains of such plants being in the past saved from ready seeders, the seed grower's intention being to product the greatest quantity of seed, and our present desire—the production of leafiness, density of growth, and, the greatest of all, persistency. Even in the case of Prairie grass it might be possible to produce strains with much greater leaf production. This remark also applies to strains of White Clover which, in some instances, only appears suitable for the production of seed, the quantity of actual leaf being very small.

Trial Plots at Lawnton.

From small trials carried out by the Acclimatisation Society during 1930 it was evident that considerable difference exists in these plants. As a start on this work the Department has now arranged for a large number of plots to be grown for a period of not less than three years at Lawnton. Such plots have been set out in a manner that allows for their extension, if necessary, and for the keeping of careful records as to the persistency of the different strains of both grasses and clovers that will put up with Queensland conditions if kept free from weeds and aided by a light dressing of fertilizers to encourage growth. With work of such character, although progress reports will be made, definite conclusions cannot be arrived at until at least three years.

A PROLIFIC HEN.

By P. RUMBALL, Poultry Expert.

QUEENSLAND Egg Laying Competitions have once again demonstrated the prolificacy of Queensland poultry. This time the record was established at the Maryborough test by an Australorp hen, owned by Mr. N. D. Wilson. Unfortunately a full twelve months' record is not available, as the bird did not start to lay until nearly six weeks after the commencement of the test.

From the 1st May to the 28th February (304 days) 324 eggs were laid by this hen. Thus it is demonstrated that an egg a day is not the limit of the fowl. The production of this bird, during certain months, is of more interest than the total number laid, as will be seen from the following figures:—

Month.	Number of eggs laid.	Number of days when laying took place.
July	29	27
August	32	30
September	30	28
October	37	30
November	47	30
December	41	21

On the 29th December the bird went broody, but laid another 54 eggs during January and February, laying on fifteen separate days no less than two eggs.

Poultry-raisers may view with suspicion these figures. The writer is kept posted with the production of the birds in the various competitions and, owing to the remarkable performance of this hen, made arrangements for a departmental officer to visit the test daily for a short period and record the eggs. The honesty of the attendant was in no way questioned but, in order that the records would be beyond suspicion, the pen was sealed, and so arranged that an egg could not be placed in the secluded nest in which the hen regularly laid. Prior to this the hen had been noticed on frequent occasions to visit the nest twice daily.

The egg-size, even when two were laid, was up to the usual standard. The average egg, during the month of May, weighed $1\frac{3}{4}$ oz., and during June, $2\frac{1}{8}$ oz.

I am of the opinion that in this case the hen had two ovaries and oviducts functioning. Under normal conditions, as breeders are aware, the right oviduct and ovary atrophy and disappear before the chicken is hatched. There are exceptions, however. Professor Rice has recorded the fact of a hen possessing two ovaries and oviducts, and that both were functioning. I have noted this on one occasion, and probably some breeders attending a demonstration on post-mortem examination given to the National Utility Poultry Breeders' Association will recollect the finding of two oviducts in a White Leghorn hen; the specimen is here reproduced. The organs were not in full production state, but the plate indicates the possibility of this taking place.

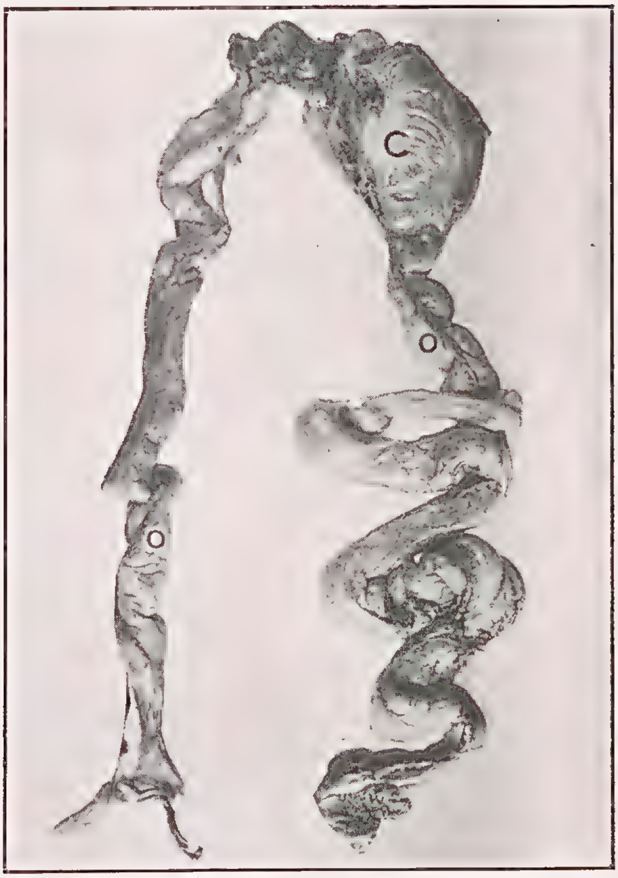


Plate 104.—This Plate Shows Two Partially Developed Oviducts Removed by Mr. Rumball from a White Leghorn Hen.

o. Oviduct. c. Cloaca.

QUEENSLAND SHOW DATES.

Childers: 2nd and 3rd June.
Marburg: 2nd and 3rd June.
Gin Gin: 4th to 6th June.
Wowan: 4th and 5th June.
Bundaberg: 11th to 13th June.
Gladstone: 17th and 18th June.
Lowood: 19th and 20th June.
Mount Larcom: 19th and 20th June.
Rockhampton: 23rd to 27th June.
Mackay: 30th June to 2nd July.
Kilcoy: 2nd and 3rd July.
Home Hill: 3rd and 4th July.
Townsville: 7th to 9th July.
Gatton: 8th and 9th July.
Woodford: 9th and 10th July.
Cleveland: 10th and 11th July.
Charters Towers: 15th and 16th July.
Caboolture: 16th and 17th July.
Rosewood: 17th and 18th July.
Ithaca: 18th July.
Laidley: 22nd and 23rd July.
Nambour: 22nd and 23rd July.
Esk: 24th and 25th July.
Ayr: 24th and 25th July.
Mount Gravatt: 25th July.
Bowen: 29th and 30th July.
Cairns: 29th and 30th July.
Maleny: 29th and 30th July.
Royal National: 10th to 15th August.
Crow's Nest: 26th and 27th August.
Wynnum: 28th and 29th August.
Imbil: 2nd and 3rd September.
Enoggera: 12th September.
Beenleigh: 18th and 19th September.
Malanda: 23rd and 24th September.
Brisbane River Camp Draft: 25th and 26th September.
Rocklea: 26th September.
Kenilworth: 26th September.
Southport: 3rd October.
Nerang: 9th October.
Evelyn Tableland: 9th and 10th October.

STOCK FOODS.

By J. C. BRÜNNICH, F.I.C., F.A.C.I., Agricultural Chemist.

PART I.

The wealth of our State is based to a very large extent on the number of our live stock, and the welfare of the stock again depends entirely on the feeding; therefore the question how, when, and what to feed is of greatest importance to farmer and grazier.

All our wool, meat, hides, dairy produce, eggs, and the labour performed by horses and cattle are the result of feeding. All our live stock can be regarded as living factories producing from the food consumed products useful to man.

As a large proportion of our stock in Queensland is pasturing on natural herbage, the feeding under normal conditions is therefore more or less outside the province of agricultural science; but in times of scarcity, which periodically occur, hand feeding must be resorted to, and at such times it is of the utmost importance to have some knowledge of the composition of various stock foods, which have to be used in connection with poorer roughage to keep stock in good condition.

In this paper Mr. Brünnich discusses stock foods and their values, and his notes will be accepted by readers as a valuable contribution to our information on important points in animal husbandry.

IT may be safely stated that at present, in the matter of feeding, local ideas are very elementary, or such mistakes would not be made as feeding starving sheep with chaffed sugar-cane, bought at an exorbitant price, considering that its food value is less than half that of poor bush hay, or a quarter of that of lucerne chaff. Professor Perkins drew attention to similar mistakes made in South Australia in 1914-15, when chaff was the most costly stock food on the market, and still it continued throughout to be most eagerly sought after, to the almost complete neglect of relatively cheaper concentrated foodstuffs.

Objects of Feeding.

The body of the young animal requires a sufficient amount of food to supply the materials necessary for its growth. But even during any part of the growing stage there is a continued breaking down and wearing out of all the tissues of the body, and this loss must be made up by the nutrients contained in the food to keep the animal in a normal healthy condition. Furthermore, food must be supplied to produce the energy for the carrying out of all voluntary and involuntary functions of the body. An animal working hard is using up a large amount of fat and muscle, but even an animal at rest requires food for the production of heat and other involuntary

functions of its body. Summarised the objects of feeding are as follow:—

(1) To maintain bodily heat;
(2) To repair waste tissues;
(3) To reproduce young;
(4) To form new tissues and organs;
(5) To perform muscular labour;
(6) To secrete various products;
(7) To lay up reserve stores.

Composition of Foods.

In order to get a clear insight into the art of feeding and carrying out of the objects above mentioned, we must understand the composition of the tissues that require building and renewing, and the composition of the foodstuffs available.

The composition of any stock food, analysed according to present conventional methods, is expressed as follows:—

Lucerne hay (in full flower) contains:

Moisture	10·0 per cent.
Crude protein	15·0 per cent
Crude fat	2·8 per cent.
Carbohydrates or nitrogen free extract, by difference	33·2 per cent.
Crude fibre	31·0 per cent.
Ash	8·0 per cent.
	100·0 per cent.

Putting these results in another form, we find—

I. Moisture		10·0 per cent.
II. Dry matter		90·0 per cent.
(A.) Ash or mineral matter		8·0 per cent.
(B.) Organic matter 82·0 per cent.	Proteins	15·0 per cent.
	Fats	2·8 per cent.
	Carbohydrates	33·2 per cent.
	Fibre	31·0 per cent.

I. Moisture.—All foods contain a varying amount of water or moisture, even in apparently dry foods. In the animal body water constitutes about two-thirds of the body weight, and, as a rule, not sufficient water will be supplied by the food, and therefore an additional amount of water must be a separate part of the animal's food, and such water has to be of good quality, and not too saline.

The average amounts of moisture found in stock foods are as follow:—

Oil cakes, meat meals, &c.	6 to 10 per cent.
Grains, seeds, and meals	10 to 15 per cent.
Hay	8 to 12 per cent.
Grasses, ensilage	65 to 83 per cent.
Roots and tubers	70 to 90 per cent.

Stock foods which contain small amounts of moisture always keep better than moist foods, and foods containing large amounts of water should be cheaper than dry foods.

II. Dry matter of a food is the solid matter left after all the water has been driven off by artificial drying. The dry matter, on which

the actual food value of a stock food depends, can be separated by burning or ashing into—

(a) Ash or mineral matter; and

(b) Organic matter.

(A.) **Ash or mineral matter** comprises about 5 per cent. of the body weight of an animal, and has most important functions to perform, as it enters into the formation of bones and teeth, of blood, and other fluids of the body, and direct and control various life processes. The importance of ash in stock foods influencing the welfare of stock has already been dealt with in previous papers ("Queensland Agricultural Journal," March and April, 1926, and subsequently December, 1929, and January, 1930). The ash of stock foods should contain sufficient amounts of lime, potash, and phosphoric acid, and smaller amounts of iron, magnesium, soda, sulphuric and hydrochloric acid, silica, and traces of hydrochloric acid and iodine.

As many of our stock foods are deficient in certain mineral matter, they may be supplemented by giving the animals licks.

Excess of mineral matter, as found for instance in immature mangels and fodders grown on saline country, may cause trouble, just as an excess of salt in the drinking water may cause ill-health and even death of animals.

The amount of mineral matter in stock food varies with the stage of maturity, as some of the mineral matter is returned to the soil by the plants towards the end of the flowering and seeding stage of growth.

A liberal supply of mineral matter, more particularly lime and phosphoric acid, must be given to young growing animals, and at least double the amount of that actually required for the body should be supplied, as large amounts are wasted in the excreta. Mineral salts are also of the greatest importance to female animals during the periods of reproduction (gestation) and feeding their young (lactation).

A milch cow receiving a liberal ration of food which, however, was lacking in lime, continued, during a test lasting 110 days, to yield about 3 gallons of milk daily. The milk contained about $\frac{3}{4}$ oz. of lime, and a little over 1 oz. of lime was lost daily in the excreta and urine. During this trial the cow must have used up one quarter of the total amount of lime contained in her skeleton to make up for the lime deficiency in the food.

When making up rations the mineral matter of foods must be taken into consideration. All cereals and their by-products are low in lime. Legumes, like clover, lucerne, cowpea, field peas, &c., contain high amounts of lime. The amount of phosphorus or phosphoric acid is low in straw, chaff, potatoes, and other root crops, whereas large amounts are found in cereals, bran, oil cakes, meat, and fish meals.

The amount of mineral matter found in stock foods will vary considerably according to the quality of soil on which they were grown.

During the years 1910 to 1914 a large number of ash analyses were made in connection with an investigation of the food value of

various crops, and it is of interest to give a summary of the results of the analyses obtained, showing the variation of lime and phosphoric acid contents and the average amounts.

	100 lb. of Fodder Contains lb. of—	
	Lime. CaO.	Phosphoric Acid. P_2O_5.
Wheat straw	0·22 (0·16/0·25)	0·11 (0·06/0·20)
Wheat hay	0·25 (0·20/0·32)	0·39 (0·30/0·48)
Barley hay	0·45 (0.35/0·50)	0·56 (0·47/0·59)
Cowpea hay	2·30 (1·70/3·02)	0·50 (0·33/0·62)
Field pea hay	2·40	0·36
Lucerne hay	2·00 (1·65/2·47)	0·56 (0·48/0·78)
Mitchell grass hay	0·52 (0·35/0·84)	0·34 (0·18/0·50)
Rhodes grass hay	0·50 (0.27/0·70)	0·57 (0·27/0·96)
Paspalum hay	0·50 (0·16/1·01)	0·38 (0·17/0·72)
Prairie grass hay	0·55 (0·20/0·90)	0·51 (0·18/0·81)
Summer grass hay	0·21	0·76
Couch grass hay	0·80	0·63
Green sorghum	0·20 (0·09/0·31)	0·12 (0·07/0·16)
Pumpkins	0·03	0·15
Mangels	0·03	0·09
Carrots	0·11	0·18
Mixed pasture hay	0·45 (0·30/0·57)	0·41 (0·18/0·65)
Wheat, grain	0·06 (0·03/0·08)	0·86 (0·34/0·96)
Bran	0·09	3·00
Pollard	0·08	2·10
Maize	0·02 (0·01/0·07)	0·70 (0·60/0·86)
Cotton-seed meal	0·36	2·60
Linseed meal	0·50	1·70
Cocoa nut oil cake	0·32	0·94
Sorghum ensilage	0·11	0·24

The younger the plant the more rapidly available is the ash for animal nutrition. During and after the flowering stage the silica contents increase rapidly, and the digestibility is much decreased.

Of the root crops, mangels contain, as a rule, more ash than swedes, and the large amount of lime sulphate in their ash is a drawback, as it causes bladder stone troubles with sheep.

The best utilisation of the mineral constituents of food is in laxative rations, and from 20 to 30 per cent. of the mineral matter is digested; the remainder is returned to the soil in the form of fæces and urine. If the ration is made costive, the digestibility of mineral matters is at once considerably lowered, even if present in large excess, and although the food remains a much longer time in the digestive tract than in the case of laxative foods.

The great value of bran, although relatively poor in the amount of ash it contains, lies in the fact of inducing laxativity of costive rations, thereby increasing the digestibility of mineral matter. The addition of any very fibrous food, like poor hay, straw, &c., causes a great decrease of the availability of mineral matters, and this is of particular importance in the case of all animals carrying or rearing their young. Hay exposed to rain will lose large amounts of mineral matter, and growth of any moulds will induce further heavy losses.

(B.) **Organic matter** is that portion of the food which burns when the material is strongly heated, and consists chiefly of compounds of carbon, hydrogen, and oxygen. These organic compounds were produced in the growing plants with the aid of sunlight from the carbonic acid in our atmosphere and water. The value of any stock food depends practically on the amounts and composition of this organic matter, which may be divided into **nitrogen-free compounds** and **nitrogenous compounds.** The latter, in addition to the three elements mentioned, contain nitrogen and small amounts of sulphur.

The actual composition of the organic matter is exceedingly complex, being formed of a very large number of organic compounds, but, for practical purposes, food analysis divides them into the following classes:—(1) **Proteins,** (2) **Fats,** (3) **Carbohydrates,** or as stated sometimes as **nitrogen-free extract,** and (4) **Fibre.**

(1) **Protein.**—The nitrogenous matters of the animal body, the major part being proteins, are found in the muscle, gelatinous parts of bones and tendons, brain, nerves, and other internal organs. Similarly in the stock foods the principal part of the nitrogenous material is protein. Various names have been in use, the compounds also being called proteids, albuminoids; but the name protein first proposed by Chittenden covers the whole class of these compounds. These compounds are some of the most complex organic compounds found in animals and plants, and contain carbon, 50.0-55.2 per cent.; oxygen, 19.0-24.0 per cent.; nitrogen, 15.0-17.6 per cent.; hydrogen, 6.5-7.3 per cent.; sulphur, 0.3-2.4 per cent.

In the conventional food analysis the total amount of nitrogen is determined, and the percentage of total nitrogen found is multiplied by 6.25, under the assumption that the proteins contain on an average 16 per cent. of nitrogen ($\frac{100}{16} = 6.25$), and the result recorded as **crude protein.** This amount of crude protein will, naturally, include various other nitrogenous compounds, possessing all different feeding value, and in more complete analyses the **true protein,** the actual **flesh-forming nutrients** of foods, is separately determined. Chief among the non-proteins are the **amides,** which are present to a greater or less extent in all foods, particularly in those of vegetable origin. The nutrient value of amides is similar to that of fat and carbohydrates. The value of protein is not restricted to the production of flesh, but

in case of any surplus can be utilised for the production of heat and work, or building up of body fat. Fats and carbohydrates, on the other hand, cannot replace proteins.

In the past century, during the time Liebig did important investigations in agriculture, only one protein was supposed to exist, but subsequent investigation made by a large number of scientists proved the existence of a large number of proteins, which differ from each other with regard to the **amino-acids** they yield when digested. Feeding experiments have also proved that all **the various amino-acids**, which make up the great number of proteins, **must be supplied** by the food for **complete nutrition.**

Whereas plants can build up, or synthesize, all the various amino-acids during their growth, animals cannot do so, and therefore the food they consume must supply all the nineteen or twenty amino-acids in proportionate amounts for the building up of the various proteins of their bodies, and consequently if only one of these amino-acids is lacking the animal fails to grow or thrive.

As a matter of fact the percentage of crude protein found by analysis in any food is by no means a sure guide for judging the actual nutritive value.

Thomas investigated the nutritive properties of the proteins of various foodstuffs in 1909, and introduced the term **biological value** of proteins, as measured by the percentage quantity of body proteins spared from loss by the ingestion of the proteins contained in the food.

The following values were obtained by him:—

Ox meat	104	Potato	79
Cow's milk	100	Spinach	64
Fish	95	Pea	56
Rice	88	Flour	40
Cauliflower	84	Maize	35

Later work by Robinson, in 1922, proved that the value of the proteins of cow milk was given far too high, and should be reduced to 51.

The high biological value of the proteins of rice and potatoes is of particular importance as the total amount of crude protein is only small in these important staple foods.

The importance of mixed diet or occasional change of diet is thus easily explained, to give a good supply of all the various amino-acids.

Of particular value for the maintenance and growth are **lysine** and **tryptophane.** It was observed by many experimenters that the nitrogen equilibrium was disturbed, when all proteins yielding tryptophane were kept from the ration, which then was rendered incapable of sustaining life, because tryptophane appears necessary for the normal functioning of the body, while a non-supply of lysine in the protein nutrients temporarily puts a stop to growth, and consequently to the proper utilisation of all the protein products. It was found that foods of animal origin like meat, milk, and eggs contain more of these important constituents than foods of vegetable origin, and for this reason a better rate of growth is obtained when part of the food ration is made up with meat or fish meal, and dairy products for pig-feeding. It is of interest to give a short table

published by F. E. Corrie, in the "Fertiliser, Feedstuffs, and Farm Supplies Journal," October, 1924, showing the various proteins in a number of substances, and the percentage of lysine in each of the proteins present.

Source of Protein.	Name of Protein.	Lysine per cent. in Protein.	
Cow's milk	Lactalbumin	9.16	
	Casein	7·61	(tryptophane 1·5 per cent).
Hen's egg	Albumin	3·76	
	Vitellin	4·81	
Bone, skin, &c.	Gelatin	6·00	
Beef	Protein	7·59	
Halibut (fish)	Protein	7·45	
Earthnut	Conarachin	6·00	
Peas	Vicilin	5·40	
	Legumin	4·98	
	Legumelin	3·03	
Kidney Bean	Phaseolin	4·58	
Soya Bean	Glycinin	3·39	
	Legumelin	4·91	
Maize	Glutelin	2·93	
	Zein	Nil	(tryptophane nil)
Wheat	Leucosin	2·75	
	Glutenin	1·92	
	Gliadin	Nil	(tryptophane nil)
Linseed	Protein	1·20	
Barley	Hordein	Nil	

The actual amount of lysine in some of the grains is very small; working the amount out for wheat, we find—

Proteins in Wheat.

Leucosin	0·4 per cent. with	0·011 percentage Lysine
Proteose	0·3 per cent. with	——
Edestin	0·7 per cent. with	0·015 percentage Lysine
Gluten—		
Gliadin	4·35 per cent. with	——
Glutenin	4·5 per cent. with	0·086 percentage Lysine
True proteins	10·2 per cent. with	0·112 percentage Lysine
Crude protein	12·1 per cent.	

Maize contains only very small amounts of lysine as it is absent in its principal protein, the zein. Leguminous seeds like peas, beans, and earthnuts contain relatively large amounts.

Another important amino-acid is **Cystine,** which, according to the research work of Mr. H. R. Marston, reported in Bulletin 39 of the Council for Scientific and Industrial Research, forms 13.1 per cent. of the protein of dry, cleaned wood fibre.

As vegetable proteins contain, as a rule, but little cystine, generally under 1½ per cent., according to the statement made by the late Professor T. Brailsford Robertson (in the bulletin mentioned), **to produce 1 lb. of wool protein, or about 2¼ lb. of greasy wool, no less than 8 lb. of vegetable protein must be eaten by a sheep, and the carrying capacity of any country for sheep may very probably be determined by the capacity of its pasture plants to produce cystine.**

Some artificial foods—for instance, dried blood, some meat meals, wheat grain meal, and dried yeast—are comparatively rich in cystine,

and some feeding tests with small amounts of such foods have given very encouraging results with regard to increased wool production.

A few of the proteins are extremely poisonous, as for instance **Ricin,** the protein of the castor oil bean. The presence of a few castor oil beans in feed has caused the death of horses.

(2) **Fat.**—The non-nitrogenous part of the animal is chiefly fat, which is used in the production of heat and energy. The amount of fat in the animal varies more than any of the other substances, as it may be as low as 6 per cent., and rise to 30 per cent. and more. The fat is stored up in the animal body and is consumed as required if an insufficient amount of fat is supplied with the ration.

The term " fat " includes the butter-fat in milk, fat of meat, oil in seeds, wax in plants, &c. In food analysis the amount of fat is determined by extracting it from the dry material with ether or benzine, and, because small amounts of other substances not true fats are also extracted, we call the ether extract **Crude Fat.**

The fats of various foods have not an equal value for the production of animal heat and formation of fatty tissue, the oils from oil seeds and cakes having the highest value, followed by the fat in cereals and leguminous seeds; and the fats in coarse fodders possess the smallest value, being 2.4, 2.1, and 1.9, repectively, as compared with starch, taken as the unit. From these figures it will be seen that fat has practically more than double the value of starch or sugar for the production of heat, and is really the most concentrated of food nutrients.

(3) **Carbohydrates** are a typical vegetable product, found only in small amounts in the animal body. They are composed of the elements carbon, hydrogen, and oxygen, and the two latter always in the same relative proportion as found in water. Usually from 50 to 70 per cent. of the dry matter in stock foods consists of carbohydrates, in soluble and insoluble forms, but all are readily digested by the animals. The carbohydrates can be divided into three classes—

(a) Sugar, like cane sugar, fruit sugar, &c.;

(b) Amyloses, like starch, dextrin, &c.;

(c) Mucilaginous substances, like gum, &c.

The carbohydrates are transformed into other organic compounds, and stored up in the animal body; they also are readily oxidised, and the energy produced by this process of slow combustion is used to perform work and maintain animal heat.

In the practice of conventional food analysis the amount of carbohydrates, also called **nitrogen-free extract,** is generally found by difference.

(4) **Fibre.**—The material forming the cell walls of plants is a carbohydrate **cellulose,** which exists in different forms. For food analysis the **crude fibre** is determined by boiling the fodder with weak acid and with weak alkali solutions, followed by washing, drying, and ashing.

Only portions of this crude fibre can be digested by animals. Towards the ripening period of plants the fibre becomes more woody and less digestible.

In Table I., the composition of various stock foods, stating the percentage of these four principal food constituents, and also the

average amounts of moisture and ash they contain, is given in columns 1 to 5. The amount of total dry matter is easily obtained by subtracting the amount of moisture from 100.

In many cases the variation in the percentage amounts of protein, obtained from analyses of stock foods from all parts of Queensland, are shown by giving the minimum and maximum amounts found below the average amount.

Digestibility of Foods.

The chemical composition of the food, as represented by the amounts of crude constituents given in the first five columns of Table I., are not of much value unless the actual amounts of each of the constituents which can be made use of by the animal by the process of digestion are also known.

Let us consider first the actual fate of the food, after being consumed by the animal:—

FOOD CONSUMED.

- Digested.
  - Assimilated.
    - Energy required for mastication and digestion.
    - Available for body.
      - Required for maintenance of heat, working of heart, lungs, etc.
      - Available for putting on flesh, producing milk, doing work, etc.
  - Not assimilated. Lost in fæces, etc.
- Not Digested. Lost in fæces, etc.

This table shows that only a part of the food nutrients is really available for the main objects of feeding, and that a large portion is lost. The actual determination of the amount of food digested can only be found by a large number of carefully conducted experiments, in which the food material is analysed and weighed before consumption, and the weight and the composition of the animal excrement is determined, at the same time checking by weighing the body weight of the experimental animals. There exist, however, great practical difficulties in the carrying out of these experiments, and only a very small number have been made in Australia, so that we must take for the compilation of a table of digestibility coefficients, in most cases, the results of European and American experiments.

During the year 1920 we carried out some feeding experiments with sheep at the Yeerongpilly Stock Experiment Station, and we found in most cases a good agreement with the usually accepted values; the digestibility of protein and fat was lower in some of our fodders, whereas the digestibility of the crude fibre was in some instances, in lucerne, bush hay, bran, and pollard, distinctly higher, and this is probably due to the more quickly growing nature of our plants.

The digestibility of food is influenced by the age of the crop, the conditions of growth, the treatment of the crop at the time of harvesting, and lastly to a very large extent depends on the animal itself consuming the fodder.

From the moment the food is taken into the mouth up to the time it leaves the body continual changes take place. The food is first masticated, ground up into small pieces, and saturated with saliva. Ruminants, like oxen, cows, sheep, and goats, only roughly chew the food during the first mastication, as later on they regurge the food for more thorough mastication and salivation (chewing the cud). For this reason ruminants are able to digest a larger proportion of the nutrients contained in coarser and bulky foods than horses and pigs, which have only a simple stomach. In order to prevent horses eating concentrated foods like grain, oilcakes, &c., too quickly, a certain amount of chaff must be given at the same time to ensure proper mastication. For pigs, which as a rule chew their food very lightly, any hard or coarse food must be softened by being soaked, steamed or boiled, as for instance, in the case of hard grains like maize.

During the process of digestion, which takes place first in the stomach and later in the intestines, the nutrients of the solid food are changed into soluble compounds which can be absorbed. During this process bacteria play an important part, more particularly in the digestion of fibre. The undigested residue of the food is from time to time excreted, and the time during which the food remains in the body depends on the amount of undigested matter and the size of the digestive organs. For ruminants, with an alimentary canal twenty to twenty-seven times the length of the body, it takes from three to four days. Pigs, with an alimentary canal fourteen times as long as the body, from thirty to forty hours, and with horses about twenty-four hours.

In Table II. the digestibility **or coefficients of digestibility** of the various nutrients of the stock foods, the percentage amounts of each of the crude nutrient digested is given, and the average values were used for the calculation of the percentage amounts of **digestible nutrients** contained in stock foods, given in columns 7 to 11 in Table I.

Nutritive Ratio.—We have already learned that the stock foods vary very much in their composition. All leguminous seeds, oilcakes, and meat meals contain a high percentage of protein and very little non-nitrogenous compounds, whereas grains and rootcrops contain large amounts of starchy matter with small amounts of protein. The proportion of these principal nutrients is called nutritive ratio or albuminoid ratio, or the ratio between the digestible pure protein and the sum of all the digestible non-nitrogenous nutrients. In the calculation the high amount of heat produced by fat is taken into consideration, and the formula is as follows:—

$$\text{Nutritive Ratio} = \frac{\text{Digestible pure protein}}{\text{Digest. fat} + \left\{\begin{array}{l}2\cdot4 \text{ for oil seeds and cake}\\ 2\cdot1 \text{ for cereals}\\ 1\cdot9 \text{ for coarse fodder}\end{array}\right\} + \text{digest. carbohydrates} + \text{digest. fibre.}}$$

or generally expressed as—

1 lb. digest. protein ÷ — lb. digest. non-proteins (carbohydrates, etc.).

This nutritive ratio (column 12 in Table I.) must fall between certain limits in order that the food supplied to the animal does not lead to any waste and still keeps the animal in good health and condition. The ratio will be different for young growing animals and adult stock, and as a rule for the younger animal a smaller or narrower ratio is required, as in this case the chief function of the food is to build up tissues, for which purpose chiefly proteins are necessary.

Milk, which is the natural food of the young animal, has a nutritive ratio of 1 ÷ 4. As a rule, it may be stated that the young animals require a ratio of 1 ÷ 4 to 1 ÷ 5. For adult animals the ratio should be about 1 ÷ 6, and for the fattening of adult animals a much wider ratio of about 1 ÷ 8 or even more is required. Milking cows need a ratio from 1 ÷ 5 to 1 ÷ 5·4; a very heavy milker a ratio of 1 ÷ 4·5.

In the **chart** given in the appendix the position of all foods in regard to the average nutritive ratio of 1 ÷ 5 is clearly shown. All the foods above the line are rich in protein, and the foods below the line contain less protein, and must be mixed with the protein-richer foods to make standard rations.

Starch Equivalent.—In order to compare roughly the total heat-producing and fat-forming powers of stock foods, the value of starch equivalent was introduced, which expresses the amount of pure starch, equivalent to the sum of all the digestible fat-forming nutrients in each food.

The relative fat-forming powers of the various nutrients is, according to Kellner, as follows:—

1 lb. digestible fat	in oily seeds and oil cakes	= 2·4 lb. of starch
	in cereal and leguminous seeds	= 2·1 lb. of starch
	in coarse fodders (grass, hay, and straw)	= 1·9 lb. of starch
1 lb. of digestible carbohydrates and fibres		= 1·0 lb. of starch
1 lb. of digestible protein		= 0·94 lb. of starch

For exacting work a distinction should be made between maintenance starch equivalent and production starch equivalent, the former expressing the value of the food, equivalent to starch, necessary to maintain the animal at rest, without any gain or loss of weight.

The production starch equivalent, which is given in column 14 of Table I., takes into consideration the **value number** (V.) of foods (column 13 of Table I.), which expresses the percentage availability of the digestible nutrients in the stock food, with 100 being the maximum value.

Experiments have shown that most food stuffs have a food value below the expected value as calculated from the various digestible nutrients, due to the amount of energy wasted in the work of mastication and digestion. Wheat straw, for instance, is from 60 to 70 per cent. below the expected full value of 100, and, therefore, the value number is given as 30. As a rule, the low value numbers of all coarse foods are associated with the amount and quality of the fibre present.

The formula for the calculation of the **production starch equivalent per 100 lb.** is as follows:—

$$\left[\text{Digest. protein} + \cdot 94 + \text{digest. fat} + \begin{Bmatrix} 2\cdot 4 \text{ oil seeds} \\ 2\cdot 1 \text{ cereals} \\ 1\cdot 9 \text{ coarse fodders} \end{Bmatrix} + \text{digestible carbohydrates} + \text{digestible fibre}\right] \times \text{V.}$$

This calculated value of the production starch equivalent is the best measure for comparing various foods for the production of fat, milk, growth, and work.

The term starch equivalent, introduced by Kellner, is used by other authorities in several different senses, more particularly with regard to the actual heat produced by the slow combustion of the carbohydrates in the animal body.

The relative value of food may be based on its **thermal value** or its heat-producing power, expressed in terms of **calories.** The amount of heat required to raise the temperature of a unit of water (1 gramme) by 1 deg. C. is called a calorie. The following figures give the heat of combustion or calorific power of a few substance in calories:—

Amides (Asparagine)	3,500
Proteins (mean)	5,700
Carbohydrates (mean)	4,000
Vegetable oils and fats (mean)	9,300

The actual fuel value of any food can be determined by burning the substance in an apparatus, called a calorimeter, or can be calculated from the figures given above, if its composition is known. To make the figures conveniently small the term **Great Calorie,** equal to 1,000 calories, is used, and also the term **Kilo-pound-unit, Kt,** the amount of heat required to raise the temperature of 1,000 lb. of water from 15 deg. C. to 16 deg. C.

According to F. A. Murray ("Chemistry of Cattle Feeding and Dairying"), the total fuel value of meadow hay containing 2·5 per cent. crude fat, 10 per cent. protein, 42 per cent. carbohydrates, and 26 per cent. fibre is 3·64 Kt per lb.; which means that if 1 lb. of this hay is burned, enough heat is produced to raise the temperature of 3,644 lb. of water by 1 deg. C. This total fuel value, however, is not a true measure of the nutritive value of the food. Some parts are only partly oxidised, some of it is not oxidised at all and is excreted in fæces and urine, other parts again are lost in form of gases. Murray states for meadow hay the **actual available energy** is—

$$\underset{\text{Kt.}}{\overset{\text{Food.}}{3{\cdot}65}} - [\underset{\text{Kt.}}{\overset{\text{Dung.}}{1{\cdot}61}} + \underset{\text{Kt.}}{\overset{\text{Urine.}}{0{\cdot}035}} + \underset{\text{Kt.}}{\overset{\text{Gases.}}{0{\cdot}173}}] = 1{\cdot}83 \text{ Kt.}$$

This available energy may be used for the calculation of rations for stock. An ox of 1,000 lb. live weight requires about 35 Kt. of available energy supplied by the food. The amount of food is not directly proportional to the live weight of the animal; an ox weighing 1,600 lb. does not require exactly twice as much food as an ox of only 800 lb. weight, because the surface of the body, which is the cause of a great loss of heat by radiation, is not in direct proportion to the weight. Whereas an ox of 800 lb. weight requires 30 Kt., an ox of 1,600 lb. requires 48 Kt. All rations are usually calculated on 1,000 lb. live weight, and therefore if the weight of the animal is less than 1,000 lb., something must be added to the average ration, and when it weighs more than 1,000 lb. something may be deducted from the calculated quantities.

Food Units.—The market price of any stock food is by no means a measure of its relative feeding value. In normal seasons the market value of commonly used stock foods finds a level corresponding approximately to their feeding value, but in abnormal seasons many of the stock foods, on account of demand and scarcity, acquire quite exorbitant values. In order to approximately value stock foods and estimate the price of the food units per ton, the food units (column 15, Table I.) are calculated as follows:—

$$\text{Digest. crude protein} \times 2{\cdot}5 + \text{digest. fat} \times \left\{\begin{array}{l}2{\cdot}4 \text{ for oilcakes}\\ 2{\cdot}1 \text{ for cereals}\\ 1{\cdot}9 \text{ for coarse fodder}\end{array}\right\} \begin{array}{l}+ \text{ digestible carbo-}\\ \text{hydrates} \quad +\\ \text{digestible fibre}\end{array}$$

By dividing the market value per ton by the number of food units we obtain the cost per unit.

Bran costing £10 per ton is a very expensive food, as with seventy-eight food units would give a cost per unit of $\frac{200}{78}$ = 2s. $6\frac{3}{4}$d. The cost per unit was 1s. 11d. in 1919, and only 1s. 2d. in 1914.

The stockowner should therefore carefully compare food units and market price in order to buy stock food economically.

Other important factors influencing the value of stock foods are palatability and succulence.

Palatability is such an illusive subject that it cannot be accurately defined, but is greatly influenced by familiarity and habit or custom. Palatability has an influence on the digestion, but not necessarily all palatable foods are easily digestible, and animals may show likings for food very indigestible and even poisonous. Again, some foods particularly nutritious may be at first refused, but may eventually be readily eaten as soon as the animals get accustomed to it; best results with feeding will only be obtained by using such feeds which are palatable and readily eaten by the animals. Sudden changes of food must be avoided, and any changes by adding new foodstuffs must be very gradual.

Succulence.—The beneficial effects of succulent foods, like green pasture grass, silage, and various roots, has been amply demonstrated by scientific feeding trials and by practical common-sense experience on farms. Succulent feeds promote digestion and have a highly beneficial slight laxative action. A dairy cow can only give a maximum yield when supplied with a certain amount of succulent food. Succulent food is of particular importance for young animals to promote a rapid sturdy growth, but is just as essential to all stock, horses, pigs, and sheep.

Of great interest is the influence of radiation of various kinds, like the ultra-violet rays of sunlight, on the process of nutrition by direct action on the skins of animals, and also by action on the food itself. This action is closely correlated with the functions of certain vitamins.

All cereal grains, seeds of legumes, tubers, and edible roots are deficient in fat soluble A, lime, and salt, and their proteins are frequently of poor quality.

The palatable green leaves, although low in total amount of nutrients, are complete foods for all animals which are able to consume large quantities.

Vitamins.—The knowledge on this subject has made such rapid advance during the last few years that I cannot do better than give a summary published by Dr. E. Vanstone in "The Fertiliser Feeding Stuffs and Farm Supplies Journal" (vol. xiv., p. 10, 15th May, 1929).

The Nature of Vitamins.

Can you imagine young animals receiving plenty of food and yet making no growth? The food supplied was capable of providing the necessary amount of heat or energy; moreover, it was properly balanced—that is to say, it contained sufficient albuminoids and carbohydrates; also, it was not lacking in mineral matter. Yet the animals did not grow. A few drops of milk added to the food was sufficient to cause growth to take place, but with no milk there was no growth.

The milk contained in a few drops some substance essential for growth. The actual amount of food in the milk was extremely small,

and the amounts of the growth-promoting substances must have been still smaller.

The discovery of growth-promoting substances in milk was followed by the discovery of others in other foods, and at the present time six of these substances are known. They are called "**vitamins.**" Until more knowledge is obtained as to their nature they are distinguished from one another by the letters **A, B_1, B_2, C, D,** and **E.**

Vitamins not only possess growth-promoting qualities, but are capable of preventing certain diseases, such as scurvy, neuritis, and rickets. They make the animal less liable to bacterial infection and improve the breeding qualities. Since stock-rearing is one of the chief concerns of agriculture, facts concerning the growth of young animals, the production of meat and milk, and the health of animals are of great importance, and a knowledge of vitamins would appear to be essential.

Fat-Soluble and Water-Soluble Vitamins.

The six known vitamins can be divided into two classes. Three of them are found in foods in company with certain fats in which they dissolve; these three—namely, A, D, and E—are called "**fat-soluble vitamins.**" The remaining three—namely, B_1, B_2, and C—are usually found in watery foods and fruits. They are known as the "**water-soluble**" vitamins.

Fat-Soluble Vitamins A, D, and E.

Vitamin A.—This vitamin occurs in greatest quantity in cod liver oil, and also in egg yolks, ox fat, and butter fat. It is essential for growth. So far as present knowledge goes, it must be obtained from the food, since animals are not able to manufacture it in their bodies. Young animals have great need of it, and adult animals are able to store it. If the food of young animals is lacking in this vitamin, growth stops and the animal soon dies. With an adult animal, a lack of this vitamin makes it more liable to contract infectious diseases.

Farm Foods and Vitamin A.

This vitamin is found associated chiefly with animal fats, and not with vegetable oils. Oil-cakes and meals do not contain this vitamin in any appreciable amount. The animal must, therefore, obtain a supply from home-grown foods, and the chief source is **pasture grass.**

It has been shown that the amount of vitamin A present in milk is greatest when a cow is fed with green food, and is least on a ration of cereals and roots. The milk contained maximum amounts of vitamins A and D when the cow was on pasture. Addition of kale to a winter ration was found to increase the amount of vitamin A in the milk, and a similar effect was obtained by addition of cod liver oil in small amounts. Hay will contain less vitamin A than pasture grass, because this vitamin is destroyed by oxidation.

Winter Feeding of Dairy Cows and Vitamin A.

Evidence appears to be accumulating that high-yielding dairy cows after three or four years react to the tuberculin test, and their breeding qualities become diminished. This happens even when the rations are adapted to the milk yield and sufficient mineral matter is supplied. Is it not possible that a deficiency of vitamin A often occurs in the ration?

The high yield of milk means a high yield of vitamin A, which is present in the milk fat. It is known that the animal can store vitamin A and that milk in summer contains more vitamin A than milk in winter. The effect of the high milk production might be to use up slowly the animal's store of vitamin A, with the result that in a few years there is a greater liability to infection and a degeneration of the productive powers. The inclusion of a little cod liver oil in oil-cakes and meals would probably ensure a sufficiency of this vitamin.

The Ricket-Preventing Vitamin.

Vitamin D.—This vitamin is found with vitamin A in cod liver oil. It differs from vitamin A, however, in its ability to cure and prevent rickets and in the fact that it is not so easily destroyed by oxygen.

It is well known that a deficiency of minerals, such as lime and phosphoric acid, will cause rickets, but there may be a sufficiency of these minerals and an absence of this vitamin D, and under those circumstances the bones are imperfectly formed. The presence of this vitamin assists the animal in correcting any improper balance of lime and phosphoric acid. It also possesses growth-promoting qualities.

Vitamin D and Sunlight.

If two lots of animals are given the same food, which is deficient in vitamin D, and one lot is kept in the dark while the other lot is occasionally exposed to sunlight, it has been found that those in the dark develop rickets, but not those in the sunlight. The ultra-violet light may change a substance present in the body into vitamin D, and may also call up the reserves in the body of vitamin D.

Within the last few years the remarkable fact has been demonstrated that foods that do not possess ricket-curing properties can actually obtain them by exposing them to ultra-violet light, and they also acquire growth-promoting powers. In this way such foods as dried milks, olive oil, linseed oil, cotton-seed oil, meals, and flour, &c., can obtain ricket-curing and growth-promoting qualities.

The value of milk for curing rickets depends on the extent the cow is exposed to sunlight, as well as on the diet. The addition of cod liver oil increased the amount of vitamin D in the milk, and there was more vitamin D in the milk from cows on pasture. Dried summer milk contains more vitamin D than dried winter milk. It would therefore appear that there is less likelihood of a deficiency of this vitamin in the food than of vitamin A.

The discovery of this vitamin D and the researches that have followed have shown the importance of sunlight for the health of the animal.

Vitamin E (the sterility-preventing vitamin).—In the experiments on young animals given foods lacking in vitamins A and D it was frequently observed that the breeding powers were diminished. A deficiency of vitamin B was observed to affect the organs of reproduction in the male, while an addition of vitamin C to a diet in which it was lacking had the effect of increasing the number of litters. Thus a deficiency of any of the vitamins appears to affect considerably the reproductive powers.

Further investigation has shown that in wheat germs, oil, and in the green leaves of plants such as lettuce and lucerne there is a vitamin with marked anti-sterility powers. Unlike vitamins A and D, this

vitamin E is only present in very small quantities in milk fat and cod liver oil. Vitamin E differs from the other fat-soluble vitamins A and D in being able to withstand heat and air. Animals are able to store this vitamin and to draw on this store when the vitamin is lacking in the diet. At present our knowledge of this vitamin is scanty, but a wide field of investigation which is likely to lead to further discovery has been opened up.

Water-Soluble Vitamins B_1, B_2, and C.

Vitamins B_1 and B_2 (growth-promoting and neuritis-preventing).—The chief sources of these vitamins are the seeds of plants, eggs, and yeast. Fortunately, they are found in nearly all foodstuffs.

The water-soluble substances in yeast have been found to possess growth-promoting powers and an ability to prevent neuritis. Until recently a single vitamin called B was considered responsible for both functions, but evidence is accumulating showing that two substances, B_1 and B_2, are probably responsible. In the absence of this vitamin, young animals cease to grow almost immediately, showing that they cannot store this substance. It affects young and old animals. Birds kept on a diet lacking this vitamin become paralysed, but are rapidly cured if a little dried yeast is added to their food.

Vitamin C.—This vitamin is found in fresh fruits and vegetables. Oranges, lemons, tomatoes, and fresh green leaves contain good supplies. It does not occur in dried seeds nor dried fruits, since it is easily destroyed by oxidation. Thus it will be present in germinating seeds and in grasses, but not to any great extent in hay. Its most remarkable character is its power to prevent and to cure scurvy. Fresh green food should be given to young pigs in order to supply this vitamin and so enable the pigs to make satisfactory growth.

Significance of Vitamins for Agriculture.

It is not possible at present to say how much of any vitamin there is present in any feeding stuff. The most that can be said is that this or that food is rich or poor in a certain vitamin.

The water-soluble vitamins, which are growth-promoting and prevent scurvy and neuritis, are present in barley, oats, maize, peas and beans, bran and sharps, and swedes, so there is little danger of any lack of these constituents. We have seen that the important fat-soluble growth-promoting vitamin D, which is able to prevent rickets, can be produced by the sun's rays from other substances in feeding stuffs and in the animal.

The only vitamin that is at all likely to be somewhat lacking is the fat-soluble vitamin A, and then only when there is a deficiency of good hay or green fodder. Grasses and clovers are rich sources of practically all the vitamins. Oil-cakes are deficient in vitamins, but by the action of ultra-violet light can acquire the properties associated with vitamin D, the preventer of rickets, but not those associated with vitamin A.

Certain foods have obtained prominence as great sources of vitamins. Cod liver oil as a source of vitamins A and D. Yeast contains practically all the vitamins, and young stock receiving milk seldom fail to make good progress. Skim milk will, of course, contain less vitamin A.

In order to measure the effects of vitamins in foods on the live weight of animals it is necessary to experiment with animals that will show a quick response. This means that so far feeding experiments on small animals only have been carried out. Usually rats, mice, guinea pigs, and birds such as chickens and pigeons have been selected. It may therefore be questioned whether the results should be applied to farm animals. It is not doubted, however, that the facts are of great importance in the nutrition of human beings, both children and adults. Vitamins are prescribed by the medical profession and a large number of vitamin preparations are now sold.

While it is possible that in many cases the significance has been over-stressed, yet the facts should not be ignored. It is certain that farm animals need vitamins and get them in most cases, but occasions of vitamin deficiency may arise in feeding pigs, calves, and poultry, and also in the case of high-yielding dairy cows. It has been stated that sterility is as common among cows of average yield and low yield as with those giving high yields, and therefore cannot be due to deficiency of vitamins. The subject is, however, of sufficient importance to justify full investigation, and this could be done through the milk-recording societies.

Conclusion.

The growth of our knowledge of vitamins emphasises the importance of green foods for young stock and of good pastures for stock of all kinds. For the production of healthy animals making satisfactory live-weight increase, the food must be complete in albuminoids, carbohydrates, minerals, and vitamins.

Vitamins, mineral substances, and the other constituents of the foods are not independent, but mutually dependent. Only in exceptional cases, such as in the case of high-yielding milking cows, will there be likelihood of vitamin A shortage. Any deficiency can be remedied by the feeding of cod liver oil and dried yeast. Finally, sunlight is of immense importance to the wellbeing of the animal. It calls up reserves of vitamins and also manufactures more from other materials in the body.

Acknowledgment.

In compiling this article the writer has consulted the following:—

1. Recent Advances in Biochemistry, by J. Pryde, M.Sc.
2. The Abstracts of the Journal of the Chemical Society.
3. The Annual Reports of the Progress of Chemistry, published by the Chemical Society.

[TO BE CONTINUED.]

THE JOURNAL A HELP TO THE FARMER.

A Warwick farmer writes (*14th May*, 1931):—

"The Journal is something to look forward to each month. It is a wonderful help to us men on the land."

CLIMATOLOGICAL TABLE—MARCH, 1931.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	29·96	85	74	92	6	67	18	527	19
Herberton	..	81	64	93	7	58	7	138	14
Rockhampton	30·02	89	72	98	7	68	1, 28, 30	137	15
Brisbane	30·10	81	68	89	8	62	23	1492	24
Darling Downs.									
Dalby	30·08	84	63	94	8	51	22	223	9
Stanthorpe	..	77	58	89	9	46	29	187	13
Toowoomba	..	76	61	90	8	55	26	525	14
Mid-interior.									
Georgetown	29·90	97	69	101	8, 9	62	8	60	7
Longreach	29·94	94	71	106	9	59	22	359	7
Mitchell	30·03	85	66	97	9	53	23	339	10
Western.									
Burketown	29·90	93	76	103	8	68	22	41	7
Boulia	29·92	96	72	109	10	57	22, 23	247	4
Thargomindah	29·98	88	67	98	18	52	23	266	5

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MARCH, 1931, AND 1930 FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Mar.	No. of Years' Records.	Total Rainfall. Mar. 1931.	Mar. 1930.	Divisions and Stations.	Average Rainfall. Mar.	No. of Years' Records.	Total Rainfall. Mar. 1931.	Mar. 1930.
North Coast.	In.		In.	In.	*South Coast—continued:*	In.		In.	In.
Atherton	9·74	30	2·87	3·10	Nambour	9·32	35	13·86	7·72
Cairns	18·12	49	8·58	14·22	Nanango	3·46	49	5·25	1·42
Cardwell	16·02	59	8·95	7·64	Rockhampton ..	4·58	44	1·37	1·02
Cooktown	15·25	55	5·19	11·42	Woodford	7·98	44	12·18	4·00
Herberton	8·04	44	1·38	3·77					
Ingham	15·71	39	17·86	18·51					
Innisfail	26·61	50	7·60	38·03					
Mossman	17·43	18	..	14·91	*Darling Downs.*				
Townsville	7·45	60	4·60	1·02	Dalby	2·76	61	2·25	2·62
					Emu Vale	2·48	35	1·82	1·49
Central Coast.					Jimbour	2·63	43	2·40	3·18
					Miles	2·70	46	3·86	1·60
Ayr	6·76	44	5·10	0·66	Stanthorpe	2·70	58	1·87	2·30
Bowen	5·76	60	2·20	0·64	Toowoomba ..	3·81	59	5·25	1·68
Charters Towers ..	3·89	49	0·65	2·51	Warwick	2·56	66	2·40	1·25
Mackay	12·27	60	4·69	4·54					
Proserpine	12·44	28	5·43	7·01					
St. Lawrence.. ..	5·45	60	0·84	0·51	*Maranoa.*				
					Roma	2·62	57	3·75	0·25
South Coast.									
Biggenden	3·99	32	3·60	5·49					
Bundaberg	5·19	48	6·91	1·77	*State Farms, &c.*				
Brisbane	5·82	80	14·92	2·85					
Caboolture	7·62	44	15·13	4·30					
Childers	4·57	36	6·59	1·12	Bungeworgorai ..	1·54	17	2·67	0·22
Crohamhurst ..	11·30	38	18·43	7·25	Gatton College ..	3·20	36	4·30	2·56
Esk	4·92	44	4·80	2·87	Gindie	2·66	32	1·85	3·18
Gayndah	3·07	60	6·39	0·77	Hermitage	2·24	25	2·71	1·37
Gympie	6·23	61	9·75	3·06	Kairi	8·04	17	..	2·24
Kilkivan	3·90	52	8·36	1·99					
Maryborough ..	6·04	59	5·56	3·05	Mackay Sugar Experiment Station ..	11·30	34	5·31	4·39

GEORGE G. BOND, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—APRIL, 1931.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	29·93	86	73	89	1, 2	67	20, 27	643	11
Herberton	..	78	61	87	2	53	30	215	11
Rockhampton	30·01	86	64	94	2	58	23	51	4
Brisbane	30·06	79	61	90	2	56	22	361	8
Darling Downs.									
Dalby	30·07	79	53	88	2	41	9	288	5
Stanthorpe	..	71	46	80	1	30	9	174	11
Toowoomba	..	72	52	81	1	43	3, 4	279	5
Mid-Interior.									
Georgetown	29·90	94	69	98	1, 2	57	26, 27	10	2
Longreach	29·96	88	62	98	1	50	4	116	2
Mitchell	30·04	80	52	91	1	41	9, 10	51	2
Western.									
Burketown	29·91	90	69	94	6	61	21	523	5
Boulia	29·96	87	63	99	1	52	5, 6	0	..
Thargomindah	30·04	78	59	90	1	48	4	88	3

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1931 AND 1930 FOR COMPARISON.

Divisions and Stations.	Average Rainfall. April.	No. of Years' Records.	Total Rainfall. April. 1931.	April. 1930.	Divisions and Stations.	Average Rainfall. April.	No. of Years' Records.	Total Rainfall. April. 1931.	April. 1930.
North Coast. ..	In.		In.	In.	*South Coast—continued:*	In.		In.	In.
Atherton	4·18	30	4·03	0·53	Kilkivan	2·23	52	1·64	2·22
Cairns	11·57	49	12·00	4·73	Maryborough ..	3·75	59	2·89	2·70
Cardwell	9·01	59	6·04	1·01	Nambour ..	6·18	35	3·36	3·61
Cooktown	8·77	55	6·52	1·90	Nanango	1·90	49	1·71	0·72
Herberton	3·89	44	2·15	1·29	Rockhampton ..	2·82	44	0·51	1·93
Ingham	8·03	39	9·87	3·64	Woodford	4·49	44	2·05	1·66
Innisfail	20·12	50	20·01	5·81					
Mossman Mill ..	8·59	18	6·20	1·15					
Townsville	3·48	60	3·00	..	*Darling Downs.*				
Central Coast.					Dalby	1·33	61	2·88	1·98
					Emu Vale	1·26	35	2·03	1·29
Ayr	2·62	44	1·67	..	Jimbour	1·30	43	2·00	0·65
Bowen	2·83	60	1·14	0·12	Miles	1·42	46	1·62	1·04
Charters Towers ..	1·60	49	0·67	0·11	Stanthorpe ..	1·72	58	1·74	3·87
Mackay	6·56	60	1·16	2·90	Toowoomba ..	2·54	59	2·79	2·58
Proserpine	6·11	28	3·19	2·28	Warwick	1·64	66	0·99	0·61
St. Lawrence ..	2·94	60	0·33	0·39					
					Maranoa.				
South Coast.					Roma	1·36	57	0·85	2·67
Biggenden ..	2·15	32	2·38	0·76					
Bundaberg	3·12	48	1·34	0·98					
Brisbane	3·75	80	3·61	2·25	*State Farms, &c.*				
Caboolture	4·30	44	2·38	1·63					
Childers	2·87	36	1·61	1·93	Bungeworgorai ..	1·32	17	0·74	2·02
Crohamhurst ..	6·57	38	3·03	3·42	Gatton College ..	1·85	36	1·47	2·71
Esk	3·03	44	1·41	2·11	Gindie	1·23	32	0·30	0·40
Gayndah	1·41	60	1·56	1·20	Hermitage ..	1·33	25	0·88	0·62
Gympie	3·40	61	1·57	1·06	Kairi	4·03	17	..	0·12
					Mackay Sugar Experiment Station	5·14	34	1·27	1·14

GEORGE G. BOND, Divisional Meteorologist.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

[*Continued from the April issue.*]

PART V.

This is the fifth article of a series planned for the purpose of supplying information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep-raising in Queensland on comparatively small holdings.

SHEEP EXPERIMENTS AT THE QUEENSLAND AGRICULTURAL COLLEGE.

EXPERIMENTS in sheep-raising were started at the Queensland Agricultural College, Gatton, in 1913, by Mr. John Brown, then Principal, who with Mr. W. G. Brown, formerly Sheep and Wool Expert of the Department of Agriculture and Stock, propounded the scheme and secured fifteen purebred rams, including five each of the following breeds:—Lincoln, Border Leicester, and Romney Marsh; also a flock of 500 large-framed Merino ewes.

The ewes were divided into three groups, and the rams were joined with them in February.

The result of this mating was a drop of 105.6 per cent. of lambs with the loss of one ewe.

When sufficient half-bred ewes were available, two rams each of the Dorset Horn, Shropshire, and Southdown breeds were mated with them.

When Mr. John Brown left the College, I, in collaboration with Mr. W. G. Brown, continued the experiments, chiefly to discover the influence of each of the long-wool breeds when mated with the Merino as regards quantity and quality of their respective wools, the suitability of the ewes of each cross for the purpose of forming breeders' flocks, and for the purpose of proving the relative rates of development of the lambs of each cross under similar conditions.

The experience gained led to the conclusion that the Lincoln was suitable as a first cross with the Merino, as the wool from the second cross was too coarse; and that the Border Leicester and Romney Marsh were suitable in both the first cross with the Merino and the second cross with the three respective crossbred ewes; and that the Dorset Horn, Shropshire, and Southdown were more suitable for mating with the crossbred ewes. The result of mating on these lines proved satisfactory and in the sales that followed as the result of the lambing the largest percentage of lambs as fat at 4½ months was taken from the Border Leicester crosses during the first week in December, and for which the highest prices were obtained, followed closely by the Dorset Horn in both the percentage as fats and the price realised.

When the third batch of lambs was sold all the crosses were represented, and the following prices, which can be taken as a fair comparative basis for all sales, were obtained. Border Leicester-Merino cross, 20s. 9d.; Dorset Horn-crossbred, cross, 18s. 4d.; Lincoln-Merino cross, 18s. 5d.; Romney Marsh-Merino cross, 18s. 4d.; Southdown-crossbred cross, 18s. 3d.; Shropshire-crossbred cross, 18s. As this was the first sale in which the Lincoln and Romney Marsh crosses were submitted, their lambs really represent five weeks extra time to all the other crosses. In the season under review, 1915-16, several lambs were slaughtered for home consumption. The selections were from the different crosses in the proportion as selected for sale.

On the 8th February, 1916, six wether lambs, the best of those remaining after four batches had been sold, were picked out for a killing test.

They were penned up for thirty-two hours, weighed separately, killed and dressed. Following are the details:—

Cross.	Live Weight.	Offal.	Skin.	Blood.	Dressed Weight.	Value.
	lb.	lb.	lb.	lb.	lb.	*s. d.*
Lincoln x Merino ..	78 ..	22 ..	14 ..	3 ..	37 ..	25 6
B. Leicester x Merino	80½ ..	23½ ..	13 ..	3 ..	41 ..	27 0
R. Marsh x Merino ..	78½ ..	22 ..	12½ ..	3 ..	41 ..	26 9
D. Horn x crossbred	77 ..	23 ..	10½ ..	3 ..	40½ ..	25 6
Southdown x crossbred	74 ..	21 ..	9½ ..	3 ..	40½ ..	24 6
Shropshire x crossbred	75 ..	22 ..	10 ..	3 ..	40 ..	25 0

The valuation is based on flesh and skin value at 6d. per lb., and is for comparative purposes only.

Sheep as Scavengers.

In the course of the season that Mr. G. W. Brooks was Acting Principal at the College 200 tail-end wethers, road travelling for grass, were purchased. For three weeks they were used as scavengers on an old cultivation paddock, and at the end of that time several were good enough to be picked out for College consumption. In seven weeks from the time of purchase, half the mob were sold in Newmarket as fat wethers, which proved that sheep can be fattened quickly while doing useful scavenging work.

Breeding Results.

From the six breeds of rams and three crossbred lots of ewes, eighteen grades and crosses of lambs were produced. On the results achieved, Mr. C. Potts, the then Principal, decided to eliminate the Shropshire and South Down rams, because the Dorset Horn showed a better percentage in the earlier sales and realised a higher price on each occasion. The Romney Marsh was used for mating with the Merino ewes only, as they did not prove as suitable as the Border Leicester for the production of early lambs. The Border Leicester continued to be used in mating with both Merino and crossbred ewes with satisfactory results.

The result of the shearing proved that the Lincoln rams averaged 20 lb., the Border Leicesters 13 lb., the Romney Marsh 11½ lb., the Dorset Horns 6 lb., Shropshires 5½ lb., and the Southdowns 5 lb. per fleece.

The average weight per fleece of the Merino flock for one season was 7½ lb.

The Lincoln-Merino cross breeding ewes averaged 9½ lb., and Border Leicester and Romney Marsh crosses 8 lb. each. These experiments were continued until 1923 (when I left the College), and resulted in the following average details being secured:—Average lambing over five years, 78 per cent. Average losses with those mated with the Lincoln, 2 per cent. and all other breeds 1 per cent.

For comparative results during one season the wether lambs from the Merino ewes were selected when the oldest lambs were 5 months old and sold at Newmarket. The mob comprised 65 per cent. Border Leicester-Merino cross lambs, which averaged 23s. 7d. per head. The Romney Marsh-Merino cross, 20 per cent., averaged 22s. 6d. per head, and the Lincoln-Merino cross, 15 per cent., averaged 22s. 3d. per head. The second mob was selected six weeks later. The Lincoln-Merino cross totalled 4 per cent. and averaged 17s. 6d. per head. The Border Leicester-Merino cross, 35 per cent. of the total number, averaged 20s. 3d. per head. The Romney Marsh-Merino cross provided 25 per cent., and averaged 19s. 10d. per head.

When the first lot was selected for sale six lambs from the crossbred ewes were selected for slaughter. Three Border Leicester-crossbred cross ewes, and three Dorset Horn-crossbred cross ewe lambs were enclosed for twenty-four hours before slaughter and dressed 41 lb. and 39 lb. respectively.

Many lambs from the same flock were shorn and held for ration purposes. When fourteen months old, the Dorset Horn hoggets dressed up to 63 lb. and the Border Leicester crosses to 65 lb. Corriedale rams were introduced, but their progeny did not mature as quickly as any of the other crossbreeds under review.

From comparisons obtained during the period, very little could be said in favour of either the Border Leicester or Dorset Horn crosses for killing purposes, but the Border Leicester cross had the heavier fleece and was easier to handle, being without horns. Both were fossickers of the first order, but on several occasions the Dorset Horn crosses were found with their horns caught in the netting fences.

The Farmer's Flock.

In going over the whole period it was observed that the half-bred Lincoln-Romney Marsh and Border Leicester ewes, proved most satisfactory and should be suitable under similar conditions as farmers' breeding flocks. The Border Leicester, although a long-wool breed, did in every case compare favourably with the Dorset Horn in producing early maturing lambs.

The Dorset Horn made a better showing than either the Shropshire or Southdown rams in mating with crossbred ewes as regards early maturity, relative weight of carcase, and the prices realised in the open market. But the carcase of the Southdown crossbred lamb when dressed was more attractive. For rearing lambs in the coastal area any of the three crosses used was more suitable as breeders than the Merinos, excepting as regards mating, for the majority of the long-woolled crossbreds come into season in the autumn only.

The second week in February was the earliest that a successful mating could be expected in normal seasons. By allowing rams to remain with the ewes from then to the end of March lambing will terminate at the end of August. It is advisable in fat lamb raising to keep rams away from the ewes, except during the mating season.

Ewes do not require luscious feed prior to lambing, but should have a paddock sufficiently big and good enough to carry them through the lambing period without having to change them. As soon as the lamb is dropped it can with its mother be put on the best that is available, which will enhance the flow of milk and give the lamb a good kick off, which means so much to its future development. Crossbred ewes are more conveniently worked in this respect than the Merino. A crossbred ewe with a lamb may be drafted away from a mob and driven through a gateway on her own, but the Merinos do not adapt themselves to this treatment so readily. The Merinos usually feed in a mob or strung out in a continuous line. The crossbreds feed in more scattered groups with a wider spread. If handled properly they will not run together when going through them on inspection. Therefore, one may ride, drive, or walk through them (whichever is customary) and so get a better opportunity of viewing them individually.

When lamb marking takes place, which should be when the lambs are from two to six weeks old (the younger the better), it is best to erect a temporary yard in the paddock where they are pastured. This will be found more convenient than driving them to and from the ordinary yards, unless conveniently situated. Temporary yards are not likely to be germ infested.

A crossbred ewe at eighteen months—or even before that age—may be mated successfully.

Difficulties.

The chief difficulties met with during my time spent in connection with the College experiments were:

(1) *Dry Spells.*—After a long dry spell feed in the paddocks available to sheep was scarce, for the paddocks were fully stocked and the sheep had limited scope, running about two sheep to the acre or more. Ensilage made from sorghum or maize stalks chaffed up was the usual feed given to them at the rate of about ½ lb. a day at the start, and increased gradually until about 1½ lb. a day was supplied. This, with a good supply of water and pickings in the paddock, kept them going, especially if they were put onto it before they got too low in condition.

Four months was the longest period that they had to be fed, and on this occasion a little whole maize was sprinkled on the ground, which proved very beneficial.

When ensilage was first put out they would not take to it; this difficulty was overcome by sprinkling a little good lucerne chaff over it, then mixing the chaff in through it for a few days, after which no further trouble was experienced.

Regularity of feeding was one of the chief things necessary.

(2) *Hard, Dry Grasses during Winter and Early Spring.*—This on forest country in the coastal areas where frosts are severe can certainly be regarded as being very much against successful sheep-raising. No winter herbage or clover makes its appearance, so that if a paddock is eaten out before the winter no improvement can be looked to until moisture and heat exercise their influence in spring. The most successful method was to reserve an area to see the ewes through the lambing, and to grow a winter crop or run them on an old lucerne or cultivation paddock.

(3) *Dogs and Foxes.*—Usually the domesticated dogs were the most troublesome at the College. They appear to have a natural tendency towards sheep, first in

play, but in all cases finishing up in wounding them. Sheep make good game for sport, and after once drawing blood dogs become very destructive, and no owner relishes the idea of supplying mutton worth 6d. per lb. to stray mongrels, but when it comes to several sheep being destroyed to supply one feast their depredations become serious and poisoned baits are the most reliable means of checking the evil. Foxes among the young lambs are very destructive, but they are usually easily poisoned. If dogs, foxes, and dingoes are in evidence the only safeguard is a dog-proof fence.

(4) *Blowflies.*—This is a troublesome pest, but in small flocks there should be no losses.

Sheep, if blown, are easily detected and should be treated without delay. A garden spray pump attached to a cask containing a strong sheep dip solution was used to jet all the sheep, and this kept them free for some time.

A careful lookout was always kept for "struck" sheep, and when found they were crutched and swabbed, or jetted.

(5) *Stomach Worms.*—When first I took charge of the flock, stomach worms were causing losses, especially among the weaners. Drenching was resorted to. The second drench was given eight days after the first. They were then put into a different paddock. A month later two more drenches were administered. Two of these drenches were bluestone and mustard and two arsenic and epsom salts. After these four drenchings we had the sheep much improved, and had control of the worms.

Ewe weaners unable to walk to the yards were drenched where they lay, and five out of the number were included in the breeding flock. These were drenched several times each year and had reared five lambs each and then fattened for the butcher. Although the whole flock was drenched regularly each year, no deaths occurred from drenching.

Breeding ewes were drenched three weeks before lambing and showed no ill effects. Needless to say, they were handled carefully both in the yard and when under treatment.

(6) *Fencing.*—Where sheep are kept they should be secured with sheep-proof fencing and gates. There were several lines of 7-ply cyclone wire mesh which made a good sheep-proof fence; two barb wires on top made a splendid stock fence, which should last for years. Some of the fences, reliable enough when feed was plentiful, were useless when the grass was scarce and short.

Reasons for Success.

The success achieved in these experiments, to my mind, puts the matter of breeding sheep at the same distance from the coast in a position well past the experimental stage. Under similar conditions that prevail at the College (which is about 50 miles away from the coast) I can say, with confidence, that sheep can be raised successfully and profitably if healthy sheep of the right breeds are introduced and properly treated. At the College different crops were grown for sheep feed, which resulted in fattening all lambs at or before six months at the prices quoted and higher. Ten acres of rape fattened at the rate of 26 sheep to the acre as well as keeping 50 pigs going during that time, and for some time after the sheep were taken off.

Old lucerne, wheat, oats, barley, sudan grass, and panicum paddocks all gave good results, but the two great factors in favour of cultivated areas are: (*a*) That lambs are kept growing without a check; and (*b*) that cultivation destroys all worm parasites so that the lambs are healthy throughout.

Should it be desired that the lambs only have access to the growing crop, provision may be made for communication by placing revolving bars, so set apart as to allow the lambs to pass through, while the heavier framed mothers are prevented from doing so. The lambs soon become acquainted with the opening, and may be drafted through as they develop. The lambs should be allowed to remain with the mothers until ready for market. The type of lamb desired for export is that which develops into a plump, symmetrical carcase which will dress from 33 to 40 lb. at five months.

If the lambs are kept going on good food they should be sappy and show plenty bloom at this age.

Pure-bred rams of the proper type are an important factor in achieving success in fat lamb production.

Old ewes intended to be culled for age should be especially branded at mating time, fattened and sold with the lambs.

QUEENSLAND DAIRY HERDS.

PRODUCTION RECORDING.

List of cows tested by officers of the Department of Agriculture and Stock and qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn, the Jersey, and the Ayrshire Cattle Societies of Queensland. The final tests of these cows were carried out during the months of January and February, 1931. (273 days period unless otherwise stated.)

Name of Cow.	Age.	Milk Production.	Butter Fat.	Sire.	Dam.	Owner.
				JERSEY.		
		Lb.	Lb.			
Glenview Sultane of Brooklands	Junior (2 years)	5,039·4	265·184	His Majesty of Dalebank	Noble Sultane of Brooklands	F. P. Fowler and Sons, Coalstoun
Glenview Mascot of Sunnymeade	Junior (2 years)	4,400·25	256·439	Canon 3rd of Clydebank	Mascot 3rd of Sunnymeade	F. P. Fowler and Sons, Coalstoun
Hope of Hazeldean	Junior (2 years)	4,683	267·221	Lindley Bright Lad	Lindley Lady Viola	A. Bulow, Mulgeldie
Kelvinside Lady Charlotte	Junior (2 years)	4,377·05	235·011	Kelvinside Benedistine's Nobility	Charlotte of Kelvinside	J. and R. Williams, Glencliffe
Inasfayl Primrose Lady	Junior (3 years)	5,662·4	315·961	Norwood Model	Innisfail Primrose	McGeehan Bros., Kairi
Silver Lily of Woodstock	Senior (2 years)	5,665·5	267·277	Manager of Woodstock	Lily of Woodstock	P. C. Henman and Sons, Mudgeeraba
Bonnie Star of Lisieux	Senior (2 years)	5,835·518	338·678	Vera's Aureum of Pine Park	Bonnie of Southport	J. Williams, Wondai
Golden Chain of Burnleigh	Senior (2 years)	4,444·75	261·162	Trinity Baron	The Endless Chain	C. F. Klaus, Mundubbera
Trinity Popcorn	Mature	7,971·75	402·066	Cinder Duke	Oxford Barleycorn	J. Sinnamon, Moggill
Trinity Barleycorn 2nd	Mature	8,711	426·697	Clair Val Hero	Ferns Barleycorn	J. Sinnamon, Moggill
Onkaparinga Lady Jane	Mature	8,719	444·001	Oaklands Cream Lad	Stamford Lady	J. Sinnamon, Moggill
				AUSTRALIAN ILLAWARRA SHORTHORN.		
Bella 14th of Fairlie	Junior (4 years)	10,693·425	430·233	Dividend of Rosenthal	Bella 4th of Fairlie	Pledger and Dodd, Broadwater
Nita 8th of The Cedars	Junior (4 years)	11,587·27	444·397	Red Knight of Greyleigh	Nita 3rd of The Cedars	W. J. Barnes, Cedar Grove
Cherry 4th of Glenthorne	Mature	12,775·278	456·353	Pride of Glenthorne	Cherry 2nd of Glenthorne	A. J. Caswell, Wangalpong
Rene of Hilltop	Senior (2 years)	7,783	305·073	Beauty's Lad of Hillview	Irene of Hilltop	G. Heading, Murgon
Irene 2nd of Headlands	Junior (2 years)	8,748·122	313·17	Duchess Jellicoe of Fairfield	Irene of Hilltop	G. Heading, Murgon
Champion 10th of Oakvilla	Junior (2 years)	8,576·912	342·324	Victory of Greyleigh	Champion	W. Marquardt, Wondai
Wunulla Carnation 5th	Senior (3 years)	10,051·693	398·696	Starlight of Sherwood	Wunulla Carnation 2nd	J. A. Bradley, Goomeri
Vera 2nd of Fairfield	Mature	14,863·5	562·865	Fairfield of Fairfield	Vera of Fairfield	C. O'Sullivan, Greenmount
Linnette 13th of White Park	Junior (4 years)	11,777·5	408·882	Violet's Emperor of Hillview	Linnette 5th of White Park	W. T. Savage, Barnesmore
Pendant 6th of White Park	Junior (4 years)	7,515·625	371·805	Violet's Emperor of Hillview	Pendant of White Park	W. T. Savage, Barnesmore
Mona 4th of White Park	Senior (4 years)	9,345	363·997	Violet's Emperor of Hillview	Mona of White Park	W. T. Savage, Barnesmore
Olive 5th of Greyleigh	Mature	10,733·683	435·551	Foch of Greyleigh	Bella 2nd of Greyleigh	M. C. Lester, Laidley
Bella 10th of Kilbirnie	Senior (4 years)	12,518·25	523·618			Macfarlane Bros., Radford
Scarlet of Trevor Hill	Junior (2 years)	8,117·458	330·188	Prince of Braemar	Star of Trevor Hill	G. Gwynne, Umbiram
Blossom of Trevor Hill	Senior (2 years)	6,886·121	312·37	Prince of Braemar	Lena 2nd of Trevor Hill	G. Gwynne, Umbiram

QUEENSLAND DAIRY HERDS—*continued.*

PRODUCTION RECORDING—*continued.*

Name of Cow.	Age.	Milk Production.	Butter Fat.	Sire.	Dam.	Owner.
				AUSTRALIAN ILLAWARRA SHORTHORN—*continued.*		
		Lb.	Lb.			
Starlight 2nd of Beechwood	Junior (4 years)	7,698·4	346·704	Royal Lad of Blacklands	Starlight of Beechwood	F. W. Woolley, Moregatta
Rosetta 8th of Glenthorne (230 days)	Mature	10,185·375	351·534	Duke of Burradale	Rosetta 4th of Glenthorne	W. J. Kajewski, Gowrie Junction
Grannie 20th of Thornleigh	Junior (2 years)	6,085·527	235·727	Terry of Thornleigh	Grannie 16th of Thornleigh	Queensland A.H.S. and College
Red Duchess 2nd of Kelston	Mature	13,259·5	551·317	Rooseveldt 2nd	Red Duchess of Jinbiggaree	A. Frank, Boonah
Diana 11th of Kelston	Mature	14,069·5	533·631	First Warrior of the Cedars	Diana 7th of Jinbiggaree	A. Frank, Boonah
Dulcie of Lynfield	Junior (2 years)	6,097·4	259·049	..	..	F. E. Birt, Sexton
Molly 4th of Upton	Mature	10,786·125	393·868	Red Rose of Hillcrest	Molly 2nd of Upton	W. J. Barnes, Cedar Grove
Cherry 13th of Glenthorne	Junior (3 years)	8,034·6	294·964	Douglas of Grasmere	Cherry 6th of Glenthorne	T. Shuttlewood, Peachester
Belle 8th of the Cedars	Mature	10,516	355·3	..	..	Hickey and Sons, Wilston
Ivo of Dnalwon	Mature	8,824·225	352·238	Governor of Valley View	Ivy	A. J. Caswell, Wangalpong
Red Rose of Glengallon	Junior (4 years)	9,645·25	399·11	Jellicoe of Blacklands	Lassie 2nd of Glengallon	A. M. Bowman, Kin Kin
Plume 2nd of Waughope	Junior (2 years)	5,892·25	275·497	Royal of Glenburn	Plume of Waughope	A. M. Bowman, Kin Kin
Ettie of Iroquois	Senior (3 years)	8,104·467	352·55	Monarch of Sunnyside	Countess 2nd of Iroquois	H. Welch, Proston
Tibby of Iroquois	Senior (3 years)	6,840·375	307·656	Monarch of Sunnyside	Bubbles of Iroquois	H Welch, Proston
Model 3rd of Railway View	Mature	10,512	366·966	..	..	A. T. Waters, Lanefield
Gem 2nd of Hillvale	Senior (3 years)	8,913·625	404·784	Drafter of Greyleigh	Gem of Thorndale	H Welch, Proston
Cherry 4th of Bri Bri	Junior (2 years)	6,557·705	266·015	Lord Brilliant of Bri Bri	Cherry of Bri Bri	W. Middleton, Cambooya
Florrie 4th of Beechwood (259 days)	Senior (2 years)	6,717·55	290·075	Royal Lad of Blacklands	Florrie of Beechwood	F. W. Woolley, Moregatta
Mabel 3rd of Beechwood	Junior (2 years)	6,240	284·241	Royal Lad of Blacklands	Mabel 2nd of Beechwood	F. W. Woolley, Moregatta
Cherry 6th of Glenthorne	Mature	10,571·75	426·457	Duke of Burradale	Cherry 3rd of Glenthorne	W. J. Kajewski, Gowrie Junction
Topsy 6th of Werona	Senior (2 years)	8,217·302	319·91	..	..	J. W. Johnston, Wooroolin
Empress of Werona (365 days)	Mature	11,346·018	433·823	Young Kitchener of Burradale	Empress of Waughope	J. W. Johnston, Wooroolin
Bella 8th of Thornleigh	Senior (2 years)	6,456	268·381	Recruit of Thornleigh	Bella 6th of Thornleigh	Queensland A. H. S. and College
Perfect of Hill Top	Mature	10,018·329	460·527	Red Robin of Greyleigh	Doris of Springdale	G. Heading, Murgon
Beryl of Kiora	Mature	9,997·67	403·299	Red Knight of the Cedars	Beryl 3rd of the Cedars	W. J. Barnes, Cedar Grove
Tiddlewinks of Fairfield	Mature	11,141·125	357·318	Fairy's Renown of Fairfield	Marie of Fairfield	C. O'Sullivan, Greenmount
Champion 7th of Oakvilla	Senior (2 years)	9,039·221	369·186	Victory of Greyleigh	Champion 2nd of Oakvilla	W. Marquardt, Wondai
Silky 10th of Burradale	Senior (2 years)	9,193·45	366·59	Justice of Burradale	Silky 5th of Burradale	T. Shuttlewood, Peachester
Lovely 3rd of Loomhurst	Junior (2 years)	8,921·25	293·897	May Boy of Glenthorne	Lovely of Strathobi	T. Shuttlewood, Peachester
Jenny 6th of Waughope	Junior (2 years)	6,981·95	288·234	Royal of Glenburn	Jenny 2nd of Waughope	Mrs. A. Bowman, Kin Kin
Nellie 3rd of Sunnyview	Mature	14,056·8	574·711	Diamond of Greyleigh	Nellie of Bangalow	W. H Thompson, Nanango
Queenie of Glendalough	1 year 10 months	10,944·5	374·104	..	..	Hickey and Sons, Wilston
				AYRSHIRES.		
Fairview Bonnie Girl	Junior (4 years)	9,920·975	361·356	Beryl's Jock of Crescent Farm	Bonnie Jessie of Fairview	J. H and R. Andersen, Southbrook
Fairview Opal (270 days)	Senior (2 years)	9,475·75	346·377	Fairview Jeannette's Masterpiece	Orphan Girl of Fairview	J. H and R. Andersen, Southbrook

FRUIT GROWING IN NORTH QUEENSLAND.

Mr. R. M. King, Acting Minister for Agriculture and Stock, has made available the subjoined report by Mr. H. J. Freeman, Senior Instructor in Fruit Culture, on fruit-growing matters in North Queensland during the first four months of the current year.

THE weather for January, February, March, and April was reasonably good, but, considering these months should cover the recognised wet season for North Queensland, it could not be said that an excessive quantity of rain was registered. January had seventeen wet days with 1,742 points, February had fifteen wet days with 1,460 points, March had twenty-two wet days with 858 points, April had seventeen wet days with 1,200 points, making a total of 5,260 points for the four months.

Citrus Fruits.

Some very fine citrus fruits are being marketed from most of the orchards in the North. Local prices are not the best, but the bulk of the fruit railed to other centres is realising good money. At present there are three difficult propositions to handle in the consigning of citrus fruits from the North to the Southern markets, namely:—

1. The tremendous damage that the fruit-fly does. These growers do not fully realise the harm and loss occasioned by this very serious pest.
2. There is every need for a more systematic method of packing, entailing the abolition of the "flat packer," the clipping of all fruit from trees and grading and wrapping the fruit and making a reasonably tight pack.
3. A little better knowledge of marketing conditions in the South is necessary to enable one to understand what is readily saleable and how, by being so, to enable quicker distribution. The local method of selling is absolutely no guide whatever to the methods adopted in the bigger markets.

Pineapples.

Pines at present are very scarce; the odd small consignments being sold on the local market are demanding a reasonably good price. The weather evidently suits their growth admirably, for the pineapple plantations throughout the district all look particularly well.

Other Fruits.

An exceptionally fine crop of granadillas is at present being harvested, though unfortunately a fairly large percentage of the fruit is peculiarly formed, being quite restricted in the waist, this being due perhaps to physiological conditions pertaining at the actual time of the setting of the fruit.

Papaws are very plentiful, consequently prices are low.

Passion vines have given good crops, particularly off young vines, older vines being affected by a fungus trouble attacking the main stem just below the surface of the ground.

Recent consignments forwarded to the South fully establish the fact that a definite increase in the Northern banana industry is taking place. Total railage of bananas for January, February, March, and April from stations between Cairns and Townsville are 10,339 cases, approximately.

Tomatoes.

Local grown tomatoes are still very scarce; various wilts and blight are responsible for this condition, for to attempt to grow tomatoes commercially in this area, without very carefully spraying or dusting as a preventive against these troubles, is more or less a wasted effort.

All things being considered, the progress being made is reasonably good. Were it not that a general financial stringency exists throughout, the amount of fruit marketed over the past four months would have yielded returns that most decidedly would have been satisfactory.

Plenty of good land is available and transport conditions are much improved. Growing, packing, and landing the fruit on the individual markets in such condition that it meets with a ready sale must be the object of every grower. Fruit-fly in citrus, and rust and leaf-spot in bananas, if unchecked, is disastrous, and it behoves every grower to do his very utmost in an effort to combat these diseases, easily the three worst, as far as North Queensland is concerned.

THE COTTON INDUSTRY.

A DEPUTATION of members of the Queensland Cotton Board, comprising Messrs. D. C. Pryce, F. A. Kajewski, H. R. Brake, J. Beck, C. H. Bradley, and J. Bryant, R. J. Webster (manager), and Messrs. J. Harding and A. Hodgetts, representing the cotton growers, waited on the Minister for Agriculture (Hon. H. F. Walker) recently for the purpose of discussing with him certain matters relevant to the cotton industry.

Importation of Cotton Seed.

Mr. Pryce, chairman of the Cotton Board, mentioned that, in a former discussion with the Minister, the Board had recommended the introduction of cotton seed of some of the more earlier maturing varieties, the intention being to introduce several tons of seed of suitable varieties from the United States of America, but it was understood that when the Minister approached the authorities at Washington they were adverse to the importation of comparatively large quantities of seed, and suggested that a quantity of approximately 2 lb. of cotton seed from each of several varieties be imported. The introduction of further varieties of cotton seed was a burning question with the growers, and they did not appear to appreciate the proposition the Cotton Board were faced with in connection with the matter. The growers held the opinion that the Cotton Board had not shown any enthusiasm in carrying out their wishes in respect to the cotton seed importations, but were definitely of the opinion that the introduction of increased varieties would be of material assistance to them in establishing the industry in Queensland.

The Minister stated that he could assure the growers that the Cotton Board members had presented a strong case in favour of the importation of additional varieties of cotton seed, and he had visited the principal cotton-growing districts, and was convinced that the introduction of further varieties would be of material advantage, and probably lead to the ultimate selection of varieties that would suit the varying conditions of soil and climate over which cotton was grown in Queensland. The Minister had, however, been informed of the risk that was attendant upon the introduction of large quantities of cotton seed, and the danger of disease or pests being distributed through the medium of the seed being planted throughout the cotton-growing areas. He asked that the subsequent speakers would confine their remarks to the matter of the risk that was associated with the introduction of any large parcels of cotton seed.

All of the other gentlemen on the deputation spoke in support of the advantage to be gained by the importation of cotton seed of additional varieties. It was stated that the importation of cotton seed hulls had been permitted by the Federal authorities, and it was argued that there would be no greater risk in importing the cotton seed than would be incurred in introducing the hulls. It was also mentioned that while the Durango cotton had shown itself to be quite satisfactory in some districts, it did not thrive so well in other areas and locations. Cotton growing had extended over a large area of the State, and it did not appear to the deputation that a single variety of cotton would be found suitable to meet all the conditions of locations, climate, and soil.

The Government Guarantee.

Reference was made during the discussion to the action that had been taken by the Government in guaranteeing the amount required for the purchase of the plant from the British Australian Cotton Association by the Cotton Association. This action had been instrumental in placing the industry in a position to engage in the ginning of cotton and the utilisation of the by-products, such as the expression of oil from the cotton seed and the production of cotton seed meal. The industry, however, had to accept the responsibility of payment for the interest and redemption upon the moneys advanced. Additionally, the bounty granted by the Federal Government will be on a reduced scale after the 1932 season, and for these reasons it was necessary that every effort should be made to place the industry on a satisfactory basis without undue delay.

Cotton Varieties.

Mr. Wells stated that, as a result of the overtures that had been made some time ago relative to the introduction of further varieties of cotton, nine different varieties had been introduced, and these included several of the varieties that had been recommended by Mr. Webster subsequent to his visit to the United States of America. Of these nine varieties, three showed promise of being useful to the industry here. It was too early to give any definite information as to the yield and quality of these cottons, and he could not go beyond giving an expression of opinion as to the behaviour of these cottons in the test plots at present. Mr. Wells mentioned that he had some years ago recognised that the matters now mentioned by the Board would assert themselves at a comparatively early stage in the cotton-growing industry in Queensland, and, in anticipating the present difficulty, he had attempted to meet the position and had tried to get supplies of suitable varieties of cotton. He had persevered with the breeding-up of the Lone Star, Lightning Express, and Acala varieties in addition to Durango. He did not expect that Durango would prove itself to be the best cotton for growing throughout the whole of the cotton areas. Field tests had been carried out with the other varieties mentioned above, and in certain localities and soil types encouraging results were being obtained, and arrangements were being made for the more extensive use of these varieties where conditions of soil and climate seemed favourable. Given average seasonal conditions and yields, he anticipated that in the 1932-33 season there would be sufficient seed supplies to plant up some thousands of acres.

Other Matters Discussed.

The chairman of the Cotton Board also informed the Minister that, as a result of a levy imposed by the Board, certain moneys had been collected, and growers had asked the Board to issue to them scrip, with a face value equal to the amount of the deduction made from the individual growers on account of the levy.

Another matter which the Board would like to bring under notice was the payment of the amount due to the Board under the guarantee given by the Government to the growers of cotton covering the 1930-31 season cotton crop.

MINISTER'S REPLY.

The Minister, in reply, stated that he wished to congratulate the members of the Board and the growers' representatives on the able manner in which they had presented their case. He was sorry that he could not meet the Board and grant their request forthwith. He had made it a practice since he occupied the position as Minister of Agriculture to, as far as practicable, allow those engaged in primary industry to work out their own destiny. In this particular case, however, he was confronted with the possibility of the introduction of further disease and insect pests, and he did not wish to take any action that would in later years menace the industry. He had to rely upon and follow the advice of his own advisory officers on matters of this character, and he felt that no member of the deputation, were he placed in the position of Minister for Agriculture, would do otherwise than he had done. He would cause further inquiry to be made into the matter and would obtain further opinion and would advise them in due course. They could rest assured that he was extremely anxious to help the growers and the industry generally, and if a satisfactory reason for so doing could be devised he would take suitable and necessary action. The proposal of the deputation to the effect that the Government should arrange for the importation of a complement of 5 tons each of four different varieties of cotton seed was attendant with very grave risk to the industry as a whole, and he felt sure that they appreciated the necessity of his exercising very considerable precaution before introducing even comparatively small parcels of cotton seed, and proportionately with the bulk of seed imported the seriousness of reducing disease was correspondingly enhanced.

In respect to the issue of scrip to growers in recognition of the amounts collected by the levy, he would give this matter his consideration and inform them later in connection therewith.

In regard to the guarantee from the Government to the growers, he wished to inform the deputation that before payment for the amount due could be arranged, it was necessary that an officer of the Audit Department should make audit of the accounts of the Cotton Pool Board and make report to the Government. This report had only reached him the day before, and he would place the matter before Cabinet, and at an early date the Board would be further advised on the matter.

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Spear Grass—Low Grazing Value.

J.B. (Jimbour)—

The grazing value of the Spear Grasses (*Aristida* spp.) is very low, except perhaps in their very young stages. Some species are somewhat better than others, but after the very young stages they soon become unpalatable and innutritious. The best of all the Aristidas is *Aristida leptopoda*, a big-growing species common on the Downs country.

Tie Bush (*Phyllanthus brisbanicus*).

G.B. (Gympie)—

1. *Wickstraemia indica.* A species of Tie Bush, so called on account of the tough, fibrous nature of the bark. This shrub has been accused of poisoning stock at different times, but feeding tests carried out at Yeerongpilly some years back gave negative results, though at the conclusion of the experiment the calves fed on it were in very poor condition. They rapidly recovered, however, on being put on to ordinary feed.
2. *Phyllanthus brisbanicus.* Common in the North Coast country, and generally growing in shady places on the edges of standing scrub, also as secondary growth. It is quite common, but we have not heard a local name given to it. It is not known to possess any poisonous or harmful properties.

Scrub Panicum (*Echinochloa*).

C.G.P. (Clermont)—The specimens have been determined as follows:—

1. *Setaria australiensis,* sometimes known as Scrub Panicum. It is closely allied to some of the Millets, such as the Manchurian Millet and Italian Millet grown in Queensland, also the crop grown here under the name of Panicum.
2. *Echinochloa crus-galli.*
3. *Echinochloa colona.* Both species of *Echinochloa* are widely spread over the warm parts of the world, and some species in India and Africa are much cultivated as grain crops. In Queensland the well-known fodders—White Panicum and Japanese Millet—belong to this genus, and the two species you send are looked upon as probably wild parents of these cultivated forms.

We would be glad of any other grasses you care to send at any time with the interesting notes attached.

Tournefortia Tree (*Cordia subcordata*).

F.R. (Rockhampton)—The specimens have been determined as follows:—

1. *Tournefortia argentea,* the Tournefortia Tree. This tree is one of the outstanding trees of the islands of the Capricorn Group and is referred to in most books and articles dealing with that particular region. In addition to Queensland, it has a very wide distribution over the sea-coasts of the Malayan region and the islands of the Pacific.
2. *Cordia subcordata.* A shrub or small tree found along the coast of Queensland and New Guinea, but one for which we have not heard a common name. It is quite ornamental and worth growing on this account. In addition to Queensland and New Guinea, it extends over the islands of the Pacific, and is found in some parts of the Malay Archipelago.

Most trees and plants of tropical shores have a wide distribution, their seeds being adapted for carriage by water.

Algaroba Bean.

C.A.U. (Manyung)—

The specimen is *Prosopis juliflora,* the Algabora or Mesquite Bean, a native of the Southern United States and Mexico, now widely planted in tropical and sub-tropical countries as a combined shade and fodder tree. Seed has been imported by the Department of Agriculture at various times and distributed to different farmers, particularly in Northern and Central Queensland. The pods are looked upon as being very nutritious and a valuable food for stock, and the flower as a valuable honey producer.

Yams.

J. O'R. (Yatala)—

It is rather difficult to name specimens from the yam alone without any indication as to whether the plant is cultivated or native, but we should say the one you send belongs to *Vitis opaca,* a common vine in coastal Queensland. It is not a member of the true yam family. Sometimes the yams it produces are very large, but we seem to have no record of their being eaten by the natives. They are sometimes eaten by pigs, and are said to give a pink colour to the flesh when the pig is killed, but of this we have no proof.

Jack Bean.

A.K. (Kapaldo, Monto Line)—

The bean you describe we have no doubt is the Jack Bean, *Canavalia ensiformis,* a bean grown fairly extensively in different tropical countries, but only to a very limited extent in Queensland. Personally, we have grown it and used the very young beans sliced in the same way as French Beans, and the fully formed but yet green seeds in the same way as Lima Beans or Broad Beans, and have found both very good eating. We do not know why the bean has not taken on more extensively, but people are rather chary of it as it does not agree with all stomachs and, therefore, before eating the beans in large quantities it is just as well to cook and taste discreetly.

Johnson Grass.

W.T. (Eidsvold Line)—

The specimen is Johnson Grass (*Sorghum halepense*), a perennial grass allied to Sudan Grass, Imphee, and other sorghums cultivated in Queensland. It has some value as a fodder, but, like its allies, contains a prussic acid yielding glucoside, which sometimes causes trouble. On this account the plant should preferably be wilted in the sun before it is fed to stock. The grass also becomes a great pest in cultivation, and it is very difficult to eradicate once it gets a hold. Taking everything into consideration, the demerits of the grass outweigh its merits, and it is not worth bothering about as a fodder grass.

Pennyroyal.

W.A.A. (Esk)—

The specimen in *Mentha satureioides,* the native Pennyroyal. Oil of Pennyroyal is a well-known abortifacient, and therefore it is quite likely that the present plant would be injurious to cows in calf if eaten by them in any quantity. The plant is very common in grass lands in Southern Queensland and no actual cases of these causing trouble of this kind have come under our notice.

Tick Trefoil.

J.A.P. (Kairi, N.Q.)—

The specimen is a species of Tick Trefoil (*Desmodium triflorum*), a plant that seems to have increased very much of recent years in the paspalum pastures of coastal Queensland. It has valuable feeding properties, but grows rather close to the ground and so does not make any great bulk of feed. The name "Tick Trefoil" comes from the fact that the pods break up into little pieces which are readily carried about on the feet of animals, on clothing, &c.

Flame Tree.

J.P.R. (Port Douglas)—

The specimen is the Flame Tree, *Sterculia acerifolia*, a native of Queensland and Northern New South Wales. It is one of the most beautiful of our native flowering trees and is readily propagated from seed. The seeds are borne in large, blackish, boat-shaped pods and are comparatively large and easy to germinate. The wood is very soft and has no commercial value as far as we know.

Control of White Ants Attacking Living Trees.

"ANXIOUS" (Charters Towers)—The Chief. Entomologist, Mr. Robt. Veitch, advises:—

For the eradication of white ants attacking living trees, two suitable control measures are available. The first consists of the use of a poison syrup, made up according to the following New South Wales formula: 4½ lb. of molasses or treacle and 1¼ lb. of sugar are added to a solution of ¼ lb. of sodium arsenite in half-pint of boiling water. This poison syrup is then plastered on to two small pieces of soft pine board, which are then nailed or tied together, with the treated surfaces facing each other. This poisoned bait is then buried in the ground at a short distance from the tree requiring protection. The second control measure is the use of paradichlorobenzene as a soil fumigant. A trench, 3 or 4 inches deep, is dug round the trunk of the tree, not closer than 6 or 7 inches from the base of the trunk. The paradichlorobenzene is then scattered in the shallow trench, and the soil is replaced. The chemical should not be placed in contact with the roots. The amount of chemical to be used will vary with the size of the tree, and also with its state of health. In the case of young trees in a sickly condition, ½ oz. would probably be a safe dose. Larger and healthier trees may receive an application of 1 oz., or even as much as 2 oz.

Tobacco.

"Inquirer" (Warrego)—

A copy of a pamphlet on the subject of tobacco growing, which will provide you with full information in respect to the cultivation of the crop, has been posted to you. While the tobacco plant can be grown in almost any soil and under varied climatic conditions, the production of leaf satisfactory from a manufacturer's standpoint is limited to certain classes of soils, in districts where climatic conditions are favourable. The soils considered most suitable are well-drained light, friable, sandy to sandy loams, of a foot and over in depth, containing upward of 75 per cent. of fine sand, together with silt and organic matter, and preferably not more than 7 or 8 per cent. of clay. Lightness of colour in such a soil, suggestive of a low content or absence of oxides of iron and a consequent production of a high percentage of the brightest leaf, is preferred.

The average rainfall during the usual growing period—through portion of December and the whole of January, February, and March—should be between 15 and 30 inches, light falls at short intervals being preferable to heavier falls less frequently. Towards the end of March and during April, when the leaf is ripening, fine weather should prevail, much rain at this period exerting an adverse influence on leaf, colour, and texture.

At the present time the demand exists wholly for bright tobacco leaf, cured by the flue-curing process, which entails considerable expenditure in the erection of special buildings. Manufacturers refuse to purchase leaf cured by any other process.

As a result of tests carried out in North Queensland by this Department, in collaboration with the Australian Tobacco Investigation, principally at the Mareeba Tobacco Experiment Station, justification is felt in definitely recommending the production there of bright tobacco on a commercial scale. The Government has already made available an area comprising twenty-four farms. These have been taken up by various settlers and crops have been produced thereon during the season just terminated. Unfortunately the growers had to contend with an abnormal season, the rainfall during the growing period being just about half of the average for that particular district, taken over a period of thirty-four years.

Designs are now being prepared of a further area of approximately 100 farms in the vicinity of Mareeba, and it is anticipated that full particulars of these and conditions of settlement will be made available by the Land Administration Board at an early date.

Tobacco experiments, under the direction of the Australian Tobacco Investigation with this Department acting in co-operation, have been carried out also in the Central division of the State, and small flue-curing barns have been erected at Sarina, Rockhampton, and Miriam Vale for the purpose of curing the leaf raised in experimental areas situated in those localities.

The commercial culture of tobacco leaf in the Central division will be dependent largely on the results of these experiments.

In addition to the experiment work referred to in the Northern and Central divisions, good crops of tobacco leaf have been produced by private individuals in various districts, including Bowen and Harvey's Range, near Townsville. The experiment work has not so far been extended to the Southern division of the State, and consequently prospective growers are advised to confine their initial attempts at tobacco production to small experiment areas, situated in localities having conditions of soil and climate approximating to the general directions outlined in the literature issued by this Department.

The planting of seed may be made in the spring after all danger of frost has passed, or in the early summer, according to the rainfall of the district concerned.

This Department has made arrangements for supplies of seed whereby it is hoped that fresh stocks of various varieties will be available about August next.

Soil Conditions.

A.C. (Wamuran) in quest of information on a local soil condition, writes:—

The soil in question is only a small area and has been under bananas for some nine years. Red soil, northerly slope. There has been, from time to time, banana (bunch) stalks and waste fruit, &c., thrown onto the area. Banana bunches are large, also the plants; but when about six weeks from maturity the leaves die off a little and the bunches snap off at the throat of the plant. I have observed the same occurrence in old plantations. Beetle is present only slightly, and leaf-spot is not severe at all. I am inclined to think a light application of phosphoric acid might rectify the trouble—bone dust for instance.

The Agricultural Chemist, Mr. J. C. Brünnich, advises:—

This failure is a clear case of badly balanced constituents in the soil or malnutrition of plants. The soil in the locality is not very fertile, and even the best of soils would, after nine years' cropping without artificial fertilizers, show a falling-off in production. It will be very difficult to bring such neglected soil back into a state of fertility. The use of bone meal or lime would be quite useless, as banana plants require very little of either.

The land should be deeply cultivated, subsoiled, and left under lantana or pigeon peas for a year or two, and then planted again, with a heavy application of complete artificial fertilizers.

The fee for soil analysis is 10s. 6d. cash, and the specimen must be taken as an average sample of the area, soil should be taken from four to six places to a depth of 12 inches. If an analysis is required, forms and instructions would be forwarded on application.

Poultry Foods—Cowpea, Balanced Ration.

A.C. (Wamuran) asks—

1. What is the relative value of the cowpea as a grain for fowls in comparison with other grains?
2. What is necessary to balance the ration for laying fowls?

The Poultry Expert, Mr. P. Rumball, advises:—

Although cowpea has a very high protein content and therefore appears to be of greater advantage as a food than, say, wheat or maize, poultry, as a rule, do not relish the grain. Peas are better fed as part of the mash supplied to poultry, rather than as a grain, and then it is questionable whether to exceed 10 per cent. of the ration. They generally have a slightly bitter taste and, consequently, do not add to the palatability of the food.

Pamphlets on poultry-feeding giving information on balanced rations have been posted direct.

General Notes.

Dairy Produce Act—Examinations.

The 25th July next has been fixed for the holding of the annual examinations in the theory of milk and cream testing, milk grading, cream grading, butter making, and cheese making. Applications must be lodged before the 7th July, accompanied with the necessary fee of 5s. for each subject.

New Bird and Animal Sanctuaries.

His Excellency the Governor in Council has approved of the issue of an Order in Council declaring part of Cooroorah Station, Blackwater (Emerald district), and the Oakey Creek Water Supply Dams, near Mount Garnet, North Queensland, to be Sanctuaries under and for the purposes of the Animals and Birds Acts, in which it shall be unlawful for any person to take or kill any animal or bird.

Egg Board.

The election of growers' representatives to the Egg Board resulted as follows:—

District No. 1 (Bundaberg to Caboolture)—

Ronald Benjamin Corbett, Woombye. Returned unopposed.

District No. 2 (Redcliffe-Brisbane North)—

Arthur Alfred Cousner, The Gap .. .. 96 votes
Matthew Hale Campbell, Albany Creek .. .. .. 42 votes

District No. 3 (Brisbane South to Cleveland)—

Tom Hallick, Mount Gravatt. Returned unopposed.

District No. 4 (Moreton District)—

Nomination incomplete.

District No. 5 (Darling Downs)—

Francis Bell Common, Toowoomba. Returned unopposed.

Five representatives are required to hold office for one year as from 1st May, 1931.

Messrs. Corbett, Cousner, Hallick, and Common are eligible for appointment.

The appointment of the representative for District No. 4 is a matter for decision by the Minister for Agriculture and Stock (Hon. H. F. Walker).

Messrs. Corbett, Hallick, and Common were Board members for the twelve months ended 30th April, 1931.

Sugar Assessments.

The Governor in Council has approved of the issue of an Order in Council, under "*The Regulation of Sugar Cane Prices Acts*, 1915 *to* 1922," fixing the assessments on every ton of sugar-cane received at any mill after the 29th April, 1931, at 1¼d. per ton. This is the same as last year.

The Minister for Agriculture and Stock (Mr. H. F. Walker), acting under the provisions of "*The Sugar Experiment Stations Acts*, 1900 *to* 1923," has approved of the levying of an assessment of ½d. per ton on all sugar-cane received at sugar works during the season 1931-32. This is the same as last year.

The Minister has also approved of the levying of assessments for the purposes of the various Cane Pests Boards for the season 1931-32, as follows:—

Plane Creek Cane Pests Board.—On every ton of sugar-cane received at the Plane Creek Sugar Works during the season 1931-32, an assessment of 1d. per ton, which is the same as last year.

Tully Cane Pest Destruction Board.—On every ton of sugar-cane received at the Tully Sugar Works during the season 1931-32, an assessment of 3d. per ton. Last year the amount was 2d.

Lower Burdekin Pest Destruction Board.—On every ton of sugar-cane received at the Pioneer, Kalamia, Inkerman, and Invicta Sugar Works during the season 1931-32, an assessment of 1d. per ton. This is the same as last year.

South Johnstone Cane Pest Destruction Board.—On every ton of sugar-cane received at the South Johnstone Sugar Works during the season 1931-32, an assessment of 3d. per ton. This is the same as last year.

Staff Changes and Appointments.

The resignation of Mr. A. C. H. Gibbs as an Acting Inspector of Stock at Roma has been accepted.

Mr. C. J. J. Watson, of Chelmer, Mr. A. J. Boyce, of Dunk Island, via Townsville, and Mr. F. C. West, General Manager of the Oakey Creek Tin Mines, N.L., Cairns, have been appointed Honorary Rangers under "*The Animals and Birds Acts,* 1921 *to* 1924."

Constable Edward Kinbacher, of Baralaba, has been appointed an Inspector under and for the purposes of the Slaughtering Act.

Constable Eric Victor Thornton, at Gregory Downs, has been appointed an Inspector under the Slaughtering Act.

Mr. Fredrick A. Davis, of Woonon Holding, Sarina, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Constable John Nally, of Edmonton, has been appointed a Slaughtering Inspector, as from 16th May, 1931.

Messrs. J. A. Kelly, F. Roberts, and W. E. Bindley, of the Mount Crosby district, have been appointed Honorary Rangers under the Animals and Birds Acts.

Mr. John Ries, of Burrum, has been appointed an Honorary Inspector under the Diseases in Plants Acts.

Mr. James Campbell Baker has been appointed Chairman of the Isis and Childers Local Sugar Cane Prices Boards.

Mr. Hugh Henry has been appointed millowners' representative on the Tully Local Sugar Cane Prices Board.

Mr. Charles H. C. Ross has been appointed canegrowers' representative on the North Eton Local Sugar Cane Prices Board.

The appointment of Mr. W. D. Lewis as an inspector under the Diseases in Plants Acts has been confirmed as from the 14th August, 1930.

In order to prevent the further wanton destruction of bird life in the Hinchinbrook shire, the following persons resident in the district surrounding Ingham have been appointed honorary rangers under the Animals and Birds Acts:—L. Nazzari, H. E. Hollins, B. A. Lynn, E. L. Burke, H. Gillis, H. C. Heard, G. Biggs, R. B. Blackburn, G. Geeson, F. Russo, G. Cantamessa, R. Russo, H. F. Hecht, E. D. Row, T. Stallan, R. Kirkwood, G. W. C. Warren.

Animal and Bird Sanctuaries—

Fairfax and Hoskyns Islands, situated in the Bunker Group, about thirty miles east of Bustard Head (county of Flinders,(parish of Bunker) have been declared to be sanctuaries under the Animals and Birds Acts, in which it shall be unlawful for any person to take or kill any animal or bird.

Constable S. V. Noonan, of Einasleigh, has been appointed a slaughtering inspector as from 23rd May, 1931.

Mr. Frederick J. Walsh, clerk in the dairy branch of the Department of Agriculture and Stock, has been appointed also an inspector under the Dairy Produce Act.

Mr. Wallace Thistlewaite, of Grantham, has been appointed an honorary ranger under the Animals and Birds Acts.

Butter Board.

The time fixed for the lodging of a petition on the question of the continuance of the operations of the Butter Board for a further term of three years closed at the Department of Agriculture and Stock recently, and, as no petition was received, the Board will continue to function for a further term of three years as from 1st July next.

Nominations for the election of six members for the full term have been received as under:—

District No. 1.—Sydney Harold Cleminson, Malanda, and William James Sloan, Malanda.

District No. 2.—James Lockie Wilson, Calliope.

District No. 3.—James McRobert, Maryborough, and George William Young, Inverlaw, via Kingaroy.

District No. 4.—James Purcell, Toowoomba, and Wilfred Adams Russell, Dalby.

District No. 5.—Charles Henry Jamieson, Tent Hill.

District No. 6.—Thomas Flood Plunkett, Beaudesert.

The date fixed for the return of the ballot-papers to the Returning Officer is the 29th June next.

Arrowroot Board.

The Governor in Council has approved of the issue of an Order in Council empowering the Arrowroot Board to have control of arrowroot flour. A Notice of Intention to make the Order in Council was issued on the 12th February last, and a petition for a poll to make the Order was called for. A petition was received, and the result of the subsequent referendum, conducted on the 15th April, showed ninety-three votes for and thirty-five against the placing of arrowroot flour under the control of the Arrowroot Board. As a 60 per cent. majority in favour was obtained, the Order in Council has accordingly been issued.

Destruction of Brumbies.

The Diseases in Stock Act Amendment Act passed last session of Parliament provided, among other things, for the destruction of ''brumbies'' (wild horses) on stock holdings in Queensland on certain conditions. The provisions, however, only apply to such portions of the State as are proclaimed by the Governor in Council, and are limited to a period of not more than four months in any year.

A Proclamation has been passed declaring the Roma stock district to be a district in which the provisions relating to the destruction of ''brumbies'' shall apply, but such provisions shall apply in this district only for four months from the 1st June, 1931, to the 30th September, 1931. Destruction of ''brumbies'' may therefore be carried out in this district by stockowners at any time during the said four months provided that all formalities required by the Acts have first been observed.

School of Instruction for Pig Raisers.

Attention is called to the Annual School of Instruction for farmers interested in pig raising, to be held at the Queensland Agricultural High School and College, Gatton, during the period 22nd June to 3rd July, 1931. The schools have been organised to provide the means whereby farmers and their sons desirous of improving their knowledge of pig raising may come together at a convenient centre for the purpose of meeting one another and of attending practical demonstrations and lectures and indoor studies on every phase of pig raising.

As early application is essential, it will be necessary for those interested to get in touch with the Principal of the college so that arrangements may be made in ample time before the date the school opens. The social side of the life of these schools is a special feature. Before the evening lecture session begins, opportunity is afforded for a free-and-easy hour for questions and answers, during which questions relative to any branch of agriculture may be asked. At these sessions officers attend who are interested with other branches of college activities. In fact, question time is one of the most interesting periods of the day for those interested in general agriculture and dairying, as well as pig raising. The evening cinematograph and lantern lectures are also of much interest and value, and are always appreciated.

An added attraction in the school programme is the visit of inspection to bacon factories while in operation.

The school fees are exceptionally reasonable (£3 9s. 6d. for the fortnight), and cover all expenses, including board and residence. Concession fares on the railways are available to those attending on presentation of certificates signed by the college officials. Further particulars may be obtained by communicating with the Principal, Queensland Agricultural High School and College, T.P.O. South ('phone Gatton 1), or from the Department of Agriculture and Stock, Brisbane ('phone B 1544). No time should be lost, as applications must be lodged not later than 8th June, 1931.

At the college piggery more than 300 pigs are kept. These comprise representatives of the several breeds in Queensland, and they are bred for stud purposes as well as for the production of pork and bacon. An extensive series of experiments in the breeding of pigs is in operation. These experiments are under the control of the Departments of Public Instruction and Agriculture and Stock and of the Queensland Pig Industry Committee. The results of cross-breeding, and this section, should be of much interest to those attending the school. Lecturettes will be given to indicate just what is being done. The objective is to test, under farm conditions, prolificacy, suitability, early maturity, and economy of production of various types of pigs.

It is hoped that visits of inspection will also be paid to the Stock Experiment Station, Yeerongpilly, where a number of experiments are in operation, and to the Department of Agriculture and Stock, Brisbane. Post application in letter form immediately to the Principal at address mentioned.

Removal of Citrus Plants from the Burrum District Prohibited.

The Instructor in Fruit Culture at Nambour, in a report to the Director of Fruit Culture on the citrus crop in the Burrum district, stated that brown spot of mandarins was spreading throughout the district, and the disease was becoming a serious menace to the industry.

In order, therefore, to combat the further spread of the disease, a Proclamation has to-day been issued prohibiting the removal of all citrus plants from the Burrum district to any other part of Queensland.

The Acting Minister for Agriculture (Hon. Reg. M. King) has approved of the levying of an assessment of 1d. per ton on all sugar cane received at the Invicta sugar works during the season 1931-32. Last year the assessment was 2d. per ton.

Royal National Show, 1931.

The organisation of the Royal National Show, to be held in Brisbane, 10th to 15th August, is already well advanced, and prize schedules are now available for distribution. Anyone interested may write in to the Secretary of the Royal National Association, Courier Building, for a copy of this publication, and should state the section in which they are interested in order that the correct entry form may be sent. The Council of the Association are determined to maintain the high standard of Queensland's Royal Show, particularly in this time of national crisis, when it is, perhaps, more desirable than ever that the people of this great Commonwealth should realise the tremendous resources and potentialities of the country in which we live. A large sum of money has already been set aside for further ground improvements at Bowen Park, and it will be utilised for the benefit of show patrons in augmenting the comforts and appointments already in existence. Approximately £10,000 is again made available by way of prize money in the various sections of the show. Last year the Southern Press and many prominent interstate visitors and breeders were pleased to describe our Dairy Cattle Section as the finest in the Commonwealth, and the prospects for the 1931 Show bid fair to eclipse last year's effort.

Queensland holds the foremost position in the butter industry of Australia, and this has only been made possible by the shrewd foresight of the dairymen of the State in having effectively improved their herds from a production standpoint. Much leeway has been made up in the past two years by way of increased production; indeed, the effect of the sustained price collapse in London, though disconcerting at the outset, has been largely minimised by this means. The modern appointments in the rearranged Poultry Pavilion were made available for the first time at the 1930 Show, and the 2,000-odd exhibits housed there constituted a wonderful display of the feathered world. Interstate representation in this section at the forthcoming show promises to be heavy, with the result that competition will be keener than ever.

Angora rabbit owners are advised that a special non-competitive section has been provided for exhibits under this heading, the entry fee for which is 5s., members half rates.

In the Pig Section, additional classes have been provided for Wessex Saddle-backs, and also pens of export porkers and baconers. The latter should prove to be of immense educational value.

Exhibitors can assist in the heavy work of organisation by forwarding their entries early. The final closing date is 6th July.

The Royal Society of Queensland.

The Ordinary Monthly Meeting was held in the Geology Lecture Theatre of the University on Monday, 27th April, at 8 p.m. The President, Dr. D. A. Herbert, was in the chair, and about thirty members and visitors present. The following were unanimously elected members of the Society:—Miss J. Cue, B.Sc., Messrs. W. Kyle, M.A., W. McDougall, B.Sc., F. C. Bennett, B.Sc., W. L. Payne, J Brigden, M.A., and Dr. Reye. The following were proposed for ordinary membership:—Miss E. Duncan, B.Sc., Dr. J. G. Drew, and Mr. N. Fisher, B.Sc.

Dr. W. H. Bryan exhibited an interesting basaltic agglomerate from the hill known as Mount Tarampa, in the Lockyer Valley, near Tarampa.

This exhibit was commented on by Mr. Tryon.

Mr. H. A. Longman exhibited a specimen of *Demansia guttata* Parker, which had been sent to the Queensland Museum by Mr. A. McLeod, Hazelwood, Longreach. This species was described from two specimens collected at Winton by Captain (now Sir Hubert) Wilkins for the British Museum. The snake exhibited was the

third to be recorded. Comments were made on this exhibit by Dr. Marks and Mr. Tryon.

The President extended a hearty welcome to Mr. Francis, the Hon. Librarian of the Society, on his return from Europe. Mr. Francis gave an account of his trip abroad, describing the different herbaria in which he had worked, and the botanists with whom he came in contact.

Mr. White read a paper entitled "Two Previously Undescribed Queensland Myrtaceae."

The paper describes two new species of Myrtles from Queensland. The first of these is *Darwinia Porteri*, first collected by Mr. George Porter on rocky hills near Watsonville, North Queensland. The genus is an interesting one as it is confined to Australia, most of the species being natives of Western Australia. The genus commemorates the famous naturalist, Charles Darwin, and was previously only represented in Queensland by one species. It is a pretty little shrub with red and yellow flowers and when placed in water retains its freshness for quite a long time.

The second plant is a new species of Tea Tree or Melaleuca collected at Traverston at the mouth of the Burrum River by the author, and it has been named *Melaleuca Cheelii* after Mr. Cheel of the Botanic Gardens, Sydney, in recognition of his work on this genus of plants.

This paper was commented on by the President.

Professor Hawken then took the chair, and the President, Dr. D. A. Herbert, read a paper entitled "The Movements of *Neptunia gracilis*, a Native Sensitive Plant."

Neptunia gracilis is a native sensitive plant whose leaves close rapidly when touched or wounded, reopening slowly until in ten or fifteen minutes they are again in their normal position. At night they close, but to a greater extent than they do when wounded. In a wounded leaf the stimulus is transmitted along the leaf, and also slowly across the axis to opposite leaflets, and not along the axis and back down the other side.

An extract of Neptunia leaves produces a normal response in those of the American sensitive plants, *Mimosa pudica* and *Mimosa Spegazzinii*, but curiously does not produce any movement in the leaves of Neptunia itself. Extracts of a native species of wattle, *Acacia podalyriaefolia*, and of various other leguminous plants, were found to act as a stimulant in the same way, so that the property of producing a stimulant is not restricted to plants such as Mimosa and Neptunia, which show rapid movement. Non-leguminous sensitive plants such as Averhoa do not respond to the substance.

This paper was discussed by Messrs. Hines, Tryon, Longman, Dr. Marks and Professor Hawken. Professor Richards moved a vote of thanks to Mr. White and Dr. Herbert, which was carried by acclamation.

Strawberry Marketing.

His Excellency the Governor has approved of the issue of a Regulation, under "*The Fruit Marketing Organisation Acts*, 1923 *to* 1930," providing for a ballot to be taken of strawberry growers that an Order in Council be issued declaring that strawberries produced in Queensland for a period of twelve months from the 15th June, 1931, to the 14th June, 1932, shall be acquired by the Committee of Direction of Fruit Marketing as the owners thereof.

The ballot will be conducted by the Committee of Direction. The growers concerned shall comprise all growers of strawberries in Queensland who have strawberries growing in the State for market at the date of such declaration.

The Committee of Direction shall prepare a roll of growers; such roll shall be compiled from records of the Committee and such other sources of information as the Committee shall decide, and also by inserting the name of any grower who satisfies the Committee that he is a grower concerned. Such roll shall be conclusive evidence as to what persons are entitled to vote at the taking of the poll.

The Committee of Direction shall transmit, by prepaid letter post, to all persons whose names appear on the roll, a ballot-paper, and such other explanatory matter as the Committe of Direction shall decide, with a reply-paid envelope for the return of the ballot-paper. Growers shall complete the ballot-papers and return to the Committee of Direction not later than 5th June, 1931. Any ballot-paper which is not in order shall not be counted.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

BREAD.

FOOD is the source of all human energy, and most of this energy is derived from starch. The chief starch-containing foods are wheat, rye, barley, oats, rice, maize, potatoes, sago, tapioca, arrowroot. Of these wheat flour is the main energy-producing food of our race, and its relative importance has increased during the last century. The invention of the modern steel-faced plough in 1840 transformed the vast prairies of America, Russia, Australia, and other countries into wheat fields. In 1879—that is, scarcely more than fifty years ago—the invention of the modern roller-mill process of milling wheat transformed our flour into a product extremely suitable for commercial purposes, as it kept well and could be safely carried across the world. This process, unfortunately, deprived the flour of some of its nutritive value, but its product acquired a pure white colour very attractive to the human eye. The portions removed from the wheat consist of the outer coat and the embryo of the future plant. These are contemptuously termed "offals," and are fed to fowls and other animals. The most important loss is that of vitamin B. White bread differs from wholemeal bread by the absence of this vitamin. Consequently those whose food consists largely of white bread must obtain this vitamin from some other source, or they will lose health, fail to develop strong bodies, and fall easy victims to infectious diseases. Of late years, preparations of the parts of the wheat grain rejected after milling have been placed on the market in the form of preparations of bran and of wheat embryo (under the trade name "Bemax"). By their use we can add to our food the vitamin that has been taken out of it, and this is necessary for those who live chiefly on bread and butter.

"Not by Bread alone."

Bread contains, besides starch, a considerable proportion of proteids, but not such as will by themselves satisfy the needs of the human body. On bread alone, even wholemeal bread, it would be impossible to live in health. It would be equally impossible to live on bread and butter. On wholemeal bread and milk it might be possible to live indefinitely, and such a diet is well suited for invalids. The delusion that it is possible to live on a diet of bread, butter, meat, potatoes, sugar, and tea is responsible for an immense amount of ill-health. Only by the addition to such a diet of a liberal allowance of green vegetables or of milk, or of both combined, can we live healthy lives. This is not to deny that bread is a wholesome food, but it is not a complete food. A liberal allowance of other foods in addition is necessary for really good health. This is true of all forms of bread, or other foods made from flour, but if white flour is used it is of special importance to supply the deficiency of vitamin B. Bread can be partly replaced by other starchy foods. It is as unnecessary to eat bread with potatoes as butter with fat bacon, or sugar with golden syrup.

Dental Decay.

As a food bread has one great drawback, and that is its tendency to cause decay of the teeth. The ancient Egyptians, who were perhaps the first to grow cereals extensively, were the first of ancient peoples to suffer extensively from bad teeth. With modern white roller flour the effects are still worse, not only from bread but from cakes and biscuits. The child who is fed with bread and butter or biscuits between meals is almost sure to have decayed teeth before he goes to school, as is at present the fate of nine-tenths of our children. His teeth are never free from starchy particles, which go sour and cause decay. It is a safe rule never to feed children between meals, or at least to give them nothing but milk and fruit in the intervals.

The Craze for Soft Foods.

There is at present a craze for soft foods, and so we eat soft bread and butter, often rejecting the crusts. For this there is some excuse. Crisp crusts are nice, but the modern crust is often soft and tough and not nice at all. The nicest way to eat bread is first to cut it into slices and then bake them in the oven until hard and crisp right through. And yet we never see this baked bread in the home; the only place where we see it on the table is in men's clubs. Is this fashion of eating soft bread merely a habit, or is it because our women have such bad teeth that they are afraid of anything hard? For want of anything hard to bite many children have poorly developed jaws and teeth.

Safeguards.

In order to protect their teeth children should have a little acid jam with their bread and butter, or a lemon drink, or a little fruit at the end of a meal. These excite a free flow of saliva and help to cleanse the teeth. The use of a toothbrush after meals or at least after the evening meal is also a safeguard, if it is used properly.

ROSES.

A QUEENSLAND CATALOGUE.

From the Pacific Nurseries, Wondal road, Manly, near Brisbane, has come a comprehensive catalogue of new roses and a complete list of all the old favourites. Products of these well-known nurseries grace most of our gardens, and anyone extending his rose beds or planning new plots could not do better than follow the sound advice contained in this catalogue and obtain their stocks from acknowledged specialists in rose culture. Mr. C. W. Heers, the proprietor of the nurseries, advises that only the best quality of plants, true to name and type, are sent out. They are all young and worked on short stems, besides being hard pruned (branch and root) so as to ensure correct growth in their permanent positions.

From the catalogue, the following interesting points are taken:—

Time for Planting.

From June until the end of September. For the coastal, excepting perhaps the far North, we specially recommend the later period and, in support, advance the following reasons:—

(1) Every horticulturist must admit that all roses invariably exhibit luxurious and succulent growth and wealth of bloom during the months of March, April, May, and early June. This being so, we contend that as the plants are full of flowing sap they are not in a fit condition for transplanting during that period.

(2) Roses planted during the earlier months readily respond to the warm periods which assuredly occur in the middle of our winter, only to be as surely struck by our colder and more frosty days during the latter part of the winter. This shock not only checks the growth, but actually kills the tender, white, jelly-like roots then in the forming. There can be only one result—a plant with stunted growth upon which the foundation of your future tree has to be built. Remember, if these plants are left undisturbed in the nursery they remain dormant.

(3) On the other hand, a thoroughly rested and ripened plant, transplanted during late July, August, or September, according to the trend of the season, is ready to break away into full and vigorous growth as the warmth of spring appears, never to look back.

We readily admit that the rose, being a hardy plant, may even do well when planted early, but after much experience we prefer to pin our faith to late planting in most parts of Queensland, where our winter is so variable. Holding these views, we hope clients will not ask us to send roses out earlier than June, although we much prefer, whenever convenient, that you follow our advice and plant later in the season, say from the middle of July to the middle of September.

It is gratifying to us to know that quite a number of clients after acting upon our advice, write to say how pleased they are with their experience of late planting; so we reiterate—do not plant or prune roses too early in Queensland, especially along eastern slopes.

Roses should never be planted when the ground is sodden, as the soil glues together and excludes the air so necessary for the future welfare of the plant. Rather delay planting, and in the meantime bury the whole plant lengthwise, cover completely with soil and await more favourable conditions.

Planting.

Although roses do well under almost any conditions it will always repay you to trench and drain the ground. However, should the ground be flat and unsuitable for drainage, it is better to dig it a foot deep and raise the bed. Such beds require hardwood or concrete borders, otherwise the outside plants dry out too easily. Work in a liberal supply of well-rotted cow or stable manure. This work should be done at least four weeks prior to planting. Plant so that the union will be just under the surface of the ground. In the case of light, sandy soils it is an advantage to have the union as much as 2 inches below the surface. Never, on any account place fresh manure or any form of fertilizer near the roots at the time of planting.

The roots should be evenly spread and so arranged as to give them a downward tendency; cover with about 3 inches of fine soil, and press down firmly; fill in and give a liberal supply of clean water. Keep the earth away from the graft until the plant strikes; in the meantime mulch with straw in order to protect union and keep the soil from caking.

The mulch also creates an ideal condition for further waterings. Should the weather continue dry, it will be necessary to water at intervals, according to the conditions. Do not use fresh manure or artificial fertilizer near the roots when planting. Should the sun's rays become hot after planting, it is advisable to provide the plant with artificial shade.

Suckers.

Always keep a sharp lookout for briar suckers, which may from time to time sprout from below the graft. These are readily detected by their foliage, and if not removed they will, in time, kill the rose tree.

Manuring.

Roses should be heavily manured at least once a year, well-rotted animal manure being the best. It should be spread over the bed and lightly forked in. Bone dust and other suitable fertilizers are also beneficial. Established rose trees are greedy feeders, and periodical light dressings of fertilizer, applied during damp weather, give good results. Heavy soils need occasional dressings of lime, which, however, should not be used within a month or so of fertilizers.

Pruning.

There is no phase of rose culture more difficult to impart than that of pruning. After accepting the broad principles generally laid down, make a close study of the habits and peculiarities of the various types of roses. Apply common sense methods, and observe and profit by the results obtained. We are opposed to early pruning in this State for similar reasons to those advanced against early planting. However, varieties with H.P. strain may, if the canes are sufficiently ripened, be shortened during March or April to from 3 to 5 feet from the ground—the weaker the shorter. This will ensure a wealth of bloom in the late autumn. For the annual overhaul the end of July and August is the best time. Hard pruning, as practised in cold countries, must not be generally applied here. The reason is not far to seek, as the periods of inactivity are short and uncertain. Make the prevailing conditions your guide as to how and when to prune. Assist the pruning problem by observing the following golden rules during the entire season:—(1) Cut away dead, spindled wood; (2) always cut blooms and stems that have bloomed well back to a strong eye; (3) never allow seed pods to form on the bush. By these means you will encourage correct growth and freedom of bloom. There are odd varieties which resent the knife.

It is most important that plants be kept free from scale and other diseases, otherwise valuable portions have to be prematurely removed, to the detriment of the plant. Exhibitors should prune harder than those growing for general purposes. Tea roses require lighter treatment than H.T.'s and H.P.'s.

To prune, cut away all dead, diseased and spindling wood; thin out anything that is liable to crowd; cut back shoots to a strong eye, pointing outward in the case of uprights and inward on those of spreading habits; preserve any new, strong shoots coming from the base (often misnamed water shoots) that may serve to replace any worn-out stems that should be renewed every three years or so.

As soon as the new growth appears, carefully rub off any shoot that is likely to overcrowd or grow in a wrong direction.

Climbers should be allowed their fling during the time they are establishing themselves. Train the strongest canes horizontally, about 18 inches apart, shorten the ends, and cut away all other wood. Provide for the renewal of these trailers every couple of years or so.

Aphis.

Nicotine sprays, such as Black Leaf Forty, are most effective. They may be kept in check by applying the hose freely.

Scale.

Spray with either red oil, kerosene, emulsion, or any lime-sulphur mixture. Many roses are lost annually through scale.

Grubs.

For all leaf, plant, and flower-eating insects, spray with arsenate of lead, as directed.

Mildew.

This is a stubborn fungus disease that has for many years past baffled our scientists. The rose, like all other life, no doubt requires a properly balanced food, and as analyses show that our soils are often deficient in potash and lime, it is not altogether surprising to find that, where good dressings of wood ashes have been applied, appreciable improvement in reducing the mildew scourge is apparent. Experiments are being conducted all over the world in search of a cure for mildew, and reports to hand show that potash used in its various forms gives results which are at least reassuring. For our part we can say that we have found the use of wood ashes, also spent carbide, beneficial. If these are not available, try giving each established tree say 4 to 6 oz. of sulphate of potash, in addition to lime, and observe the result.

Regular sprayings with liver of sulphur (1 oz. to 2 gallons of water), or 1 oz. bicarbonate of soda to 1 gallon of water, or Bordeaux, will ward off attacks. Remedies: Flowers of sulphur, 9 parts; arsenate of lead, 1 part; well mixed; applied with a bellows when dew is on the foliage. Sprays: Sulphuric acid, 1 part to 800 parts of rain water. One ounce bicarbonate of soda to 1 gallon of rain water is a helpful spray. A drastic remedy is 2 tablespoonfuls lysol to 1 gallon of water. Sprayings should be done before noon. Always treat the underneath as well as the top of the foliage.

Failures are generally attributable to one or more of the following causes:—

Having used fresh manures or fertilizer at time of planting. Allowing roots to be exposed after unwrapping. Lack of drainage or planting in soggy ground through excessive wet weather. Planting too near the edge of raised beds, too near shrubs, trees, and/or hedges; also in shady positions. Allowing plants to dry out after westerlies. Giving too much water during first fourteen days. Heavy frosts just after planting or even when the plant is established. Planting too deep, planting too shallow, or planting too loose. Acidity in damp or poorly prepared soils. Chemical reactions from fertilisers previously applied to the soil. Plants being knocked by children or the thoughtless gardener. Dogs and cats are often the cause of plants dying or being damaged. The use of strong soap suds, &c. Planting too early or too late. Planting in same spot where a rose has been growing unless soil has been replaced.

FLOWER GARDEN.

Winter work ought to be in an advanced state. The roses will not want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, cockscombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna lily, and other bulbs. Put away dahlia roots in some warm moist spot, where they will start gently and be ready for planting out in August and September.

THE CARE OF THE LAWN.

For a lawn to be a success it must be carefully made in the first place. Good drainage is essential, for stagnant water-logged soil encourages weeds and kills the grass. The soil should be rich in plant food. Give the ground a heavy dressing of good manure, and thoroughly dig it over. Enough time should then be allowed for the soil to settle, as it must be firm when the grass is planted or there will be a series of hills and hollows shortly after. In addition to the manure apply the following mixture at the rate of 3 oz. to the square yard, forking or raking it well into the top spit of the soil:—2 lb. superphosphate of lime, 1 lb. bonemeal, and 1 lb. sulphate of ammonia.

Early in the spring, as the grass begins to grow, a heavy roller should be passed several times over the ground.

Lawns showing bare patches will require a dressing during the autumn, and the mixture previously mentioned will be found very suitable, and will keep the grass well nourished. Wood ashes and soot, combined or not, will also be found beneficial. All dressings should be applied during showery weather. If soil poverty is the cause of a patchy lawn, it is best to rake over in the autumn with a sharp-toothed rake, and dress with a good layer of fine soil and wood ashes.

KITCHEN GARDEN.

Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. In fine weather get the ground ploughed or dug, and let it lie in the rough until required. If harrowed and pulverised before that time, the soil is deprived of the sweetening influences of the sun, rain, air, and frost. When the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

Rhubarb.

The continued production of rhubarb may be greatly assisted by giving a heavy mulching of manure and hoeing it well into the soil. Keep the beds well watered, and give regularly a dressing of liquid manure, say, once a week.

It is not necessary to use forcing manures on the young stock, as plants are ruined if forced in the early stages of growth.

The rhubarb makes rapid growth during the autumn and spring, and when stalk cutting has been started liquid manuring and manuring may be given.

Orchard Notes for July.

THE COASTAL DISTRICTS.

The marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded; good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to insist on the observance of standards of quality and see that the fruit offered for sale complies with the standards prescribed, and that cases are marked accordingly.

Where the crop has been gathered, the trees may be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood till a healthy growth is met with, and cover the wounds with Bordeaux paste.

If the main limbs are infested with scale insects or attacked by any kind of moss, lichen, or fungus growth, they should be sprayed with lime sulphur.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the beetles lay their eggs, will act as a preventive. In the warmer localities a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that may be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees may be planted throughout the month. Take care to see that the work is done in accordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be renovated; but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards—and which has been the general practice—is to be deprecated. Even in new plantations there is a tendency to follow the same unprofitable lines. Far too much consideration is given to the vendor's description or the purchaser's appreciation of a particular variety or varieties. Individual tastes must be subordinated to market requirements, and the selection of varieties to the best available kind of early, medium, and late fruits. Amongst oranges Joppa should be placed first, Sabina for early fruit, and Valencia or Loon Giru Gong for late markets.

In mandarins local conditions influence several varieties, and since the introduction of the fungus known as ''scab'' the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, though Scarlet in many places is worth including, with King of Siam as a late fruit.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former and sacking for the latter.

Strawberries should be plentiful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing; well-packed boxes always realising a much higher price than indifferently packed ones on the local market. Where strawberries show signs of leaf blight or mildew, spray with Bordeaux mixture for the former and with sulphide of soda for the latter.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

July is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before the spring growth starts.

In pruning, follow the advice given in the May number; and if you are not thoroughly conversant with the work, get the advice of one of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left, there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out it is undersized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two-years' growth or more; apricots and Japanese plums on new growth and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying with lime sulphur.

All kinds of deciduous trees may be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start growth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

Farm Notes for July.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine—and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinarily cutting should be regulated to fit in with the early-flowering period—i.e., when about one-third of the plants in the crop are in flower.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

Date	June, 1931. Rises.	June, 1931. Sets.	July, 1931. Rises.	July, 1931. Sets.	MOONRISE. June, 1931. Rises.	MOONRISE. July, 1931. Rises.
					p.m.	p.m.
1	6.39	5.0	6.48	5.3	5.25	6.9
2	6.39	5.0	6.48	5.3	6.23	7.7
3	6.40	5.0	6.48	5.3	7.22	8.4
4	6 40	5.0	6.48	5.3	8.21	9.3
5	6.40	5.0	6.48	5.4	9.19	9.55
6	6.41	4.59	6.48	5.4	10.17	10.50
7	6.42	4.59	6.48	5.4	11.11	11.37
8	6 42	4.59	6.48	5.4	...	...
					a.m.	a.m.
9	6 42	4.59	6.47	5.5	12.3	12.29
10	6.43	4.59	6.47	5.5	12.57	1.24
11	6.43	4.59	6.47	5.6	1.48	2.22
12	6.43	4.59	6.47	5.7	2.40	3.22
13	6.43	4.59	6.46	5.7	3.35	4.22
14	6.44	5.0	6.46	5.8	4.36	5.22
15	6.44	5.0	6.46	5.9	5.36	6.23
16	6.44	5.0	6.46	5.9	6.37	7.19
17	6.45	5.0	6 45	5.10	7.38	8.8
18	6.45	5.0	6.45	5.10	8.36	8.50
19	6.45	5.0	6.45	5.11	9.28	9.25
20	6.46	5.0	6.44	5.11	10.14	9.59
21	6.46	5.0	6.44	5.12	10.49	10.32
22	6.46	5.0	6.44	5.12	11.25	11.5
23	6.46	5.0	6.43	5.13	11.58	11.43
					p.m.	p.m.
24	6.47	5.1	6.43	5.13	12.31	12.22
25	6.47	5.1	6.42	5.14	1.6	1.9
26	6.47	5.1	6.42	5.14	1.43	2.3
27	6.47	5.2	6.41	5.15	2.25	3.1
28	6.47	5.2	6.41	5.15	3.14	3.58
29	6.47	5.3	6.40	5.16	4.11	4.56
30	6.47	5.3	6.40	5.16	5.9	5.46
31	...	...	6 39	5.17	...	6.39

Phases of the Moon, Occultations, &c.

1 June	○ Full Moon	12 33 a.m.
8 „	☽ Last Quarter	4 18 p.m.
16 „	● New Moon	1 1 p.m.
23 „	☾ First Quarter	10 23 a.m.
30 „	○ Full Moon	10 46 a.m.

Perigee, 9th June, at 5.54 a.m.
Apogee, 22nd June, at 11 a.m.

The occultation of Tan Sagittarii, magnitude 3·5, will occur soon after 10 p.m. on the 30th, in the north-north-east, when the Moon will be full, but will require telescope or good binoculars. It should be an interesting object for general observers.

Mercury will rise at 4.42 a.m. on 1st June, at Warwick, and at 5.28 a.m. on the 15th.

Venus will rise at 4.34 a.m. on the 1st, and at 5.2 a.m. on the 15th.

Mars will rise at 11.41 a.m. and set at 11.34 p.m. on the 1st; on the 15th it will rise at 11.9 a.m. and set at 10.15 p.m.

Jupiter will set at 7.55 p.m. on the 1st, and at 7.13 p.m. on the 15th.

Saturn will rise at 8.7 p.m. on the 1st, and at 7.12 p.m. on the 15th.

The Southern Cross will be upright in the position corresponding to position XII. on the clock face at 8 p.m. on the 1st of June. It will reach position I. at 10 p.m., and position II. at midnight. As it will repeat these positions four minutes earlier on each night an observer can easily calculate its position for any time desired.

8 July.	☽ Last Quarter	9 51 a.m.
15 „	● New Moon	10 50 p.m.
22 „	☾ First Quarter	3 16 p.m.
29 „	○ Full Moon	10 47 p.m.

Apogee, 7th July, at 12.30 a.m.
Perigee, 18th July, at 10.24 p.m.

On July 1, at 8 p.m., Saturn will be about 6 degrees west of the full Moon; both in the constellation Sagittarius.

On the 6th, the earth will be 3 million miles further from the Sun than on January 3. Yet, strangely, it will be Summer time in England.

On the 9th, between 6 and 7 p.m., a glimpse of the planets Jupiter and Mercury, remarkably near to one another, may be obtained in the west-north-west—about 22 degrees north of west—very near the horizon.

On the 13th, the ringed planet Saturn will be exactly on the opposite side of the earth to the Sun. In consequence of this Saturn will rise as the Sun sets, and set when the Sun rises.

On the 18th, at 7 p.m., the planet Neptune may be looked for, with telescope or binoculars, 2 degrees southward of the Moon when nearing the western horizon.

Jupiter will be on the far side of its orbit, nearly in a line with the Sun on the 25th, when the Sun will be passing the planet from west to east. It will, of course, be lost to sight for several days before and after the conjunction.

Early in the evening on the 28th, when Saturn and the Moon come into view after 6 p.m., it will be noticeable that Saturn will be north-west of the Moon at a distance rather more than the length of the Southern Cross, the Moon having passed from west to east of Saturn four hours earlier.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

QUEENSLAND AGRICULTURAL JOURNAL.

Vol. XXXV. Parts 1 to 6.

GENERAL INDEX.

PAGE.

A.

B.

C.

INDEX TO ILLUSTRATIONS

INDEX TO ILLUSTRATIONS—*continued.*

FREDERICK PHILLIPS, Government Printer, Brisbane.

Supplement to the "Queensland Agricultural Journal," February, 1932.

VOLUME XXXVI

QUEENSLAND AGRICULTURAL JOURNAL

Issued by direction of

The Hon. the Secretary for Agriculture

Edited by J. F. F. REID

JULY to DECEMBER, 1931

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/- including postage.

QUEENSLAND AGRICULTURAL JOURNAL

Vol. XXXVI. 1 JULY, 1931. Part 1.

Event and Comment.

Pigs and Piggeries.

During recent months the Minister for Agriculture and Stock (Hon. H. F. Walker) has been engaged in co-operation with the various organisations concerned in an endeavour to improve the position of farmers who are producing and marketing pigs as a regular business. In the past the Department has not been supplied regularly with complete information relative to the pigs and piggeries on individual farms, and as this information is a first requirement in any progressive extension work, Mr. Walker has arranged for regular inspection of pigs and piggeries by dairy and stock inspectors who are stationed at convenient centres throughout the State. Under this scheme more than 2,000 inspections have already been carried out and reported on monthly. On receipt of the reports, they are checked by officers of the Dairy and Pig Raising Branches, and, where necessary, suitable action is taken to follow up the work of the inspectors. For the guidance of departmental officers whose duty it is to carry out these inspections, a set of instructions was circulated, and has since been published for general information. For the time being, it is thought that these instructions, in conjunction with the provisions of the Stock Diseases and Dairy Produce Acts, will suffice to ensure the necessary control, and it is hoped that no further amendments to existing legislation will be required, for the desire is that piggeries should be improved along the lines indicated without arbitrary enforcement of the law. In cases where pigs are undoubtedly suffering from the effects of improper accommodation and feeding, the owners will be expected—in fact, directed—to amend their methods of management, and effect necessary improvements.

The instructions issued cover the following points:—Sufficient covering to be provided at each piggery to protect pigs from exposure to rain or the direct rays of the sun. Where pigs are paddocked, effective shelter sheds must be provided.

Each sty, yard, or paddock must be of sufficient size to accommodate suitably the pigs kept therein, and, as far as practicable, be kept always in a clean and sanitary condition. Suitable feeding places must be provided, and sties or shelter sheds must be drained sufficiently to ensure reasonable cleanliness and dryness. Pigs confined in sties or yards must be fed from troughs. The enclosures must be floored with concrete or other material impervious to moisture. Pigs must always have access to a sufficient supply of clean drinking water. It is advisable for all sties to be limewashed, say, at least every six months. Pigs must not be permitted to have access to impure water, nor be fed on fermented, unsound, decayed, or unwholesome food. Conveyances for the transport of pigs during the summer months must be provided with a cover to protect the animals from the direct rays of the sun.

It is observed with satisfaction that the scheme is working well and is regarded favourably by the producers who have evinced a strong desire to co-operate with officers of the Department and to conform with instructions where their issue is necessary.

Improvement in Pork Prices.

AN upswing in pork prices was one of the brighter experiences of the month's market movements. One of the principal selling firms advises that at the mid-June sales at Enoggera buyers attended in full force. They included representatives of three meatworks as well as several of the carcass butchers and bacon-curers. Prime light pork went to 5¼d. per lb., while medium weight pork realised 4½d. to 4¾d., and baconers 4¼d. per lb., and in some instances better. Bacon pig prices have advanced to 4¼d. per lb. at the bacon factories, with corresponding increases for other than prime weights—90 to 120 lb. dressed. These prices are, of course, for prime quality sorts only; all other grades remain at the lower levels.

Fruitful Stanthorpe.

STANTHORPE fruitgrowers as a whole may congratulate themselves on the results of the past season, which was one of progress on the Granite Belt. The crop of fruit and vegetables was not so large as in the previous year, but quality production and freedom from fly and other pests ensured the realisation of comparatively satisfactory prices. The district is prosperous, and good orchards and vineyards are not for sale. Considerable improvement in farm management is evident in every direction. Green manuring is increasingly practised, and some very fine crops of peas have enriched the soil this autumn. Both spraying and pruning are now carried out more carefully and intelligently, and the working over of non-commercial varieties gradually but surely proceeded with, due to the instruction and assistance of the Department of Agriculture and Stock. In a report to the Minister (Hon. H. F. Walker), Mr. H. St. J. Pratt, Instructor in Fruit Culture, advises that the eradication of neglected fruit trees on abandoned orchards is proceeding steadily. The enlarged powers under the Diseases in Plants Act have been of considerable help in this direction.

The overseas export trade has developed remarkably during the last three years. A start was made in this direction in the 1928-29 season, when 155 cases of apples were sent to Eastern Asia. In the 1929-30 season the quota was raised to 2,200 cases, and that quantity was more than doubled last season, when over 5,000 cases, mainly apples, were exported to England, New Zealand, Canada; also Sourabaya, Singapore, and other ports in the Malayan Archipelago. Pears, grapes, and plums were also included in these overseas consignments. This export trade should in the next few years prove of immense value to Stanthorpe. The quality of the temperate fruits produced on the granite country has attained a high standard, and Stanthorpe growers with their earlier seasonal advantage should be able to obtain the full benefit of their geographical position as compared with that of producers in the Southern States.

Methods of pruning of grapes have improved considerably, and more intelligent spraying is being practised. Grapegrowers are keenly alive to the risk of disease, and new vineyards are being planted with resistant stock. All the grapes exported to New Zealand, Canada, and Eastern Asia this year arrived in good condition and realised quite satisfactory prices. Those markets will be tested still further next season. The marketing by shortsighted growers of immature grapes with little or no sugar content is reported. This practice must cease if the interests of the industry are to be conserved.

Improved Fruit Packing.

THE packing house erected last year at The Summit as an experiment has now passed that stage, and its success has again demonstrated the necessity of such equipment in every convenient centre. The Summit packing house has already proved of considerable benefit to its suppliers. Its pack, attractively labelled, is in keen demand in Brisbane, and is becoming more favourably known and appreciated in outside country centres. From The Summit 2,770 bushels of apples were exported to England, Sourabaya, and Singapore, where they were sold at satisfactory prices. This total will probably be at least doubled next season.

A Bright Outlook.

THE Stanthorpe and The Summit shows this year were an excellent advertisement of the productivity of the Granite Belt. Growers co-operated enthusiastically, and the result was that the fruit and vegetables were better in range, numbers, and especially in quality than ever before in local history.

The consignment of immature fruit is at the present time probably the greatest difficulty with which the district has to contend, and it is hoped that a special effort will be made to remedy this form of unintelligent marketing during the coming season. The outlook in the Stanthorpe district is really brighter than it has ever been, for it has been proved beyond doubt that the Granite Belt can produce fruit of an excellent quality, suitable not only for the Australian trade but also for overseas markets. The success of the export trade reduces the risk of over-production, and, given good seasons, each year should be marked by a steady expansion in all directions.

The Fur Industry.

INQUIRIES have been received recently by the Federal Government as to the possibilities of the extension of the angora and chinchilla fur industry in the Commonwealth. Owing to Australia's limited experience in breeding the requisite types of rabbits in captivity, it is impossible to state with any degree of certainty the prospects, especially in view, at the present time, of the very serious price decline in fur overseas. Generally speaking, very little headway has been made recently in the States of the Commonwealth in this industry, but more definite efforts have been made in Tasmania and New South Wales to place the industry on a commercial footing. This embryo enterprise has suffered, perhaps, like most new industries in that the small producers interesting themselves started off on unsound lines by using inferior and the wrong type of stock. It is understood, however, that the undesirable class of rabbit is being gradually culled, and the industry, though in a very small way, is on a sounder basis than hitherto. An association has recently been formed in Sydney with the object of improving and developing the standard of the rabbit used. With a view of testing the overseas market, a small parcel of angora wool was shipped recently to London for early sale. It is considered that when the industry has been stabilised chinchilla pelts may have a fair market locally. The limited market overseas, the increase in production by other countries without a corresponding increase in demand, and the heavy price decline, are certainly not at present encouraging factors.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART XVI.

(c) Mills and Milling Work—*continued.*

IN reviewing the history of the earlier sugar-mills we left the 1888 Royal Commission of inquiry as to the severe depression then existing in the sugar industry, at the Lower Burdekin. Having finished there, they next proceeded to Mackay.

Mackay.

The first sugar-mill inquired into was the Racecourse Central Mill, and Mr. Thomas Pearce, the Chairman of Directors, gave evidence. He said the mill had been erected by the Racecourse Central Sugar Mill Company through a loan obtained by the Government, to be repaid at the rate of 8 per cent. annually, the Government holding a mortgage over all the properties. Asked whether it was not one of the conditions that black labour was not to be employed, witness said "Yes, the ninth clause says—'That I will employ labourers of European extraction and none others in and about the cultivation, carting, and cutting of the cane.' There was nothing in the Articles of Association as to black labour." The mill had been ready for crushing the last season, but as only a little cane was offering, their engineer had told them that if they crushed they would sustain a loss of £200 to £300. The interest had not been paid for reasons explained to the Government; as there had been no crushing it would have involved a terrible loss. The directors were only employing a secretary at that time, and paid him £130 a year. The present season had been such that there was very little prospect of a crushing unless they bought cane. No black labour was being employed. The original cost in Glasgow of the mill was £9,897, and the total cost including erection and buildings, about £19,000. He thought the central mill system would eventually be a success, but he did not think it could be carried on by white labour, because it did not pay. The grower was to receive 8s. a ton for cane, but that was not a payable price; it was assumed that at 20 tons per acre it would just pay for the labour. They had been having adverse seasons and many of the settlers had to hunt kangaroos for food. They required about 5 miles of tramway, but had no money; there would be another 300 acres grown if there were means of bringing in the cane. Other directors of the mill were examined, one of whom said that if the farmers who had previously signed the conditions to get a central mill were now asked to sign, they would not do so.

North Eton Central Mill was next taken, and Mr. George Ironsides, Chairman of Directors, gave evidence to the effect that he, with others, had undertaken to grow cane entirely by white labour. He had 200 acres under cane, the yield being an average of 20 tons per acre. He was of opinion that cane could be grown by white labour. In 1888 they had crushed 1,400 tons of cane and had made 100 tons of sugar. It was a very bad crop. They would need to make 1,200 to 1,500 tons of sugar to pay interest and working expenses. They had not paid any interest yet, but they had not received all the money from the Govern-

ment. The total cost of the mill up to the present had been about £20,000. He could not, nor could the secretary, give them an estimate of the working expenses for the year, although it had been gone into many a time. There were twenty shareholders in the company, but they were prepared to buy cane from other growers at 13s. per ton. They did not ask whether such cane was grown by white or black labour. Their own shareholders only got 10s. a ton. The Government had promised to lend £25,000 in all. They employed two officers, the manager and the secretary. The manager received £300 a year and the secretary £100, so big salaries were not paid at that time. The witness said they got about £14 per ton for first sugar and the men employed in the mill got £1 a week, but the engine-driver got 30s. a week and the sugar-boilers £3 a week. About forty-five men were employed in the mill during crushing. The mill wanted about 10 miles of tramway, which would cost about £5,000. Witness was convinced that given good seasons the North Eton Mill would pay, and they could grow the cane exclusively with white labour. Another witness said the mill was too big and had been shoved on to the shareholders.

The next Mackay mill taken was Meadowlands. Mr. W. H. Hyne stated that the name of the estate was "Meadowlands and Balmoral," the total area being 1,437 acres, of which 320 acres were under cultivation. He had crushed cane from 200 acres last year, which was his own production, and that had yielded 250 tons of sugar; but he had also purchased about 1,800 tons of cane from adjoining farmers, paying 13s. a ton for the cane. He fed his horses with the molasses. There were £50,000 of capital invested in the estate, but it returned no interest last year. At one time he made £10,000 a year out of it, but since 1883 it had commenced to fail. The expenses last year had been £5,500. He employed Europeans and kanakas in the field, one European to four kanakas, but the European jibbed on field work. He considered field work injured the health of Europeans; great strong men came as ploughmen, and in six months they were as thin as possible. They eat as much as they can and seemed to grow weak, their health was affected by eating beef, but after the first twelve months they got acclimatised. They came out from home with big full-moon faces and after twelve months he had been ashamed to see them. The depression was caused through unnecessary legislation making kanaka labour too dear, and the low price of sugar also affected it. He was not prepared to grow cane with white labour, and could not get along with black, unless he could get it cheaper.

The Commission then dealt with Palmyra, and the owner, Mr. Hugh McCready, gave evidence. The total area of the estate was about 626 acres, 470 being under cultivation. Last year he had crushed 320 acres of his own cane and 70 from adjoining growers. His total output of sugar was 192 tons and 8,000 gallons of molasses; some of this was sold to distillers and some used for horse feed. Twenty thousand pounds was invested in the estate and he had made a loss of £1,560 last year, but it had returned interest in previous years at about 6½ per cent. on the capital invested. The working expenses were between £4,000 and £6,000. He employed Europeans to do all work in connection with ploughs and implements, and kanakas to do weeding, trashing, hoeing, and cane-cutting. Indirectly he gave employment to a large number of white men; there was no other industry in Mackay to create employment for white people outside the sugar industry. He had tried

the best white labour for light work in the field, bringing them specially from Scotland, but they simply would not do it, shammed sickness and tried all sorts of dodges to get out of it, so that he had been very glad to cancel their agreements and let them go.

Walter Trueman Paget gave evidence as to Ninderoo Mill. The estate contained 1,410 acres, of which 700 were under cane. The cane from 549 acres was cut in the 1888 season, from which 310 tons of sugar and 7,500 gallons of molasses had been made, the latter being fed to stock. The sum of £65,000 had been invested, but no interest had been returned in 1888. The plantation had returned interest in some of the previous years. The working expenses in 1888 had been £10,221, and their loss, including depreciation on machinery and buildings, was £7,321. He preferred kanakas for field work; European labour had been very unsatisfactory in the field. The machinery, freight, erection, and buildings for the mill had cost £24,000. The machinery was manufactured in Glasgow and Derby, the coolers and tanks in Mackay. The cost of the annual overhaul was from £400 to £500. Witness was of opinion that to combat the depression in the industry the continuance of kanaka labour must be assured. They worked the mill as well as they could. He had not a triple effet, but had steam evaporators. They paid 10s. a ton for cane and had paid up to 14s. They did not get as much cane as they required. In 1883 to 1885 they had paid away £9,000 for cane. In 1888 they had only paid £78 15s. The reason farmers gave him for not growing more cane was that coloured labour was dear and cane low in price.

These were all the witnesses in connection with the Mackay mills that were examined.

Rockhampton.

The Commission then proceeded to Rockhampton and examined the liquidator of the Yeppoon Sugar Company. He gave evidence that there were 2,000 acres of land in the estate, of which 700 were under sugar. They had crushed last year the cane from 475 acres, and had made about 330 tons of sugar. The total capital of the company was £40,000, of which £24,000 had been subscribed; the balance was overdraft advanced by the Bank of New South Wales. Their total expenditure for 1887 was £10,137. They paid the bank at the rate of £1,500 a year, but no interest was paid. The bank foreclosed. The machinery cost £6,840. They made very good white sugar, which realised top price. The capacity of the mill was from 1,000 to 1,500 tons of sugar. Five hundred tons was the largest they had made; they started in June and finished before December; they did not work continuously, as they had to stop several times for want of water and labour. He considered that if they had to find white labour they could not carry on at all. They received about £16 or £18 for their sugars—that was the average. The present year, 1889, they would average £20. When they first started they got £30 a ton and it had gradually come down to £17. The directors would not continue to go any further, and the property was to be sold. In the event of its not being sold, the bank would not carry it on in the uncertainty then ruling. The former chairman of the Yeppoon Sugar Company said the principal cause of their not being able to carry on was the bad season in 1888. As far as the Pandora Mill was concerned it was wound up two or three years ago owing to insufficient capital and bad seasons.

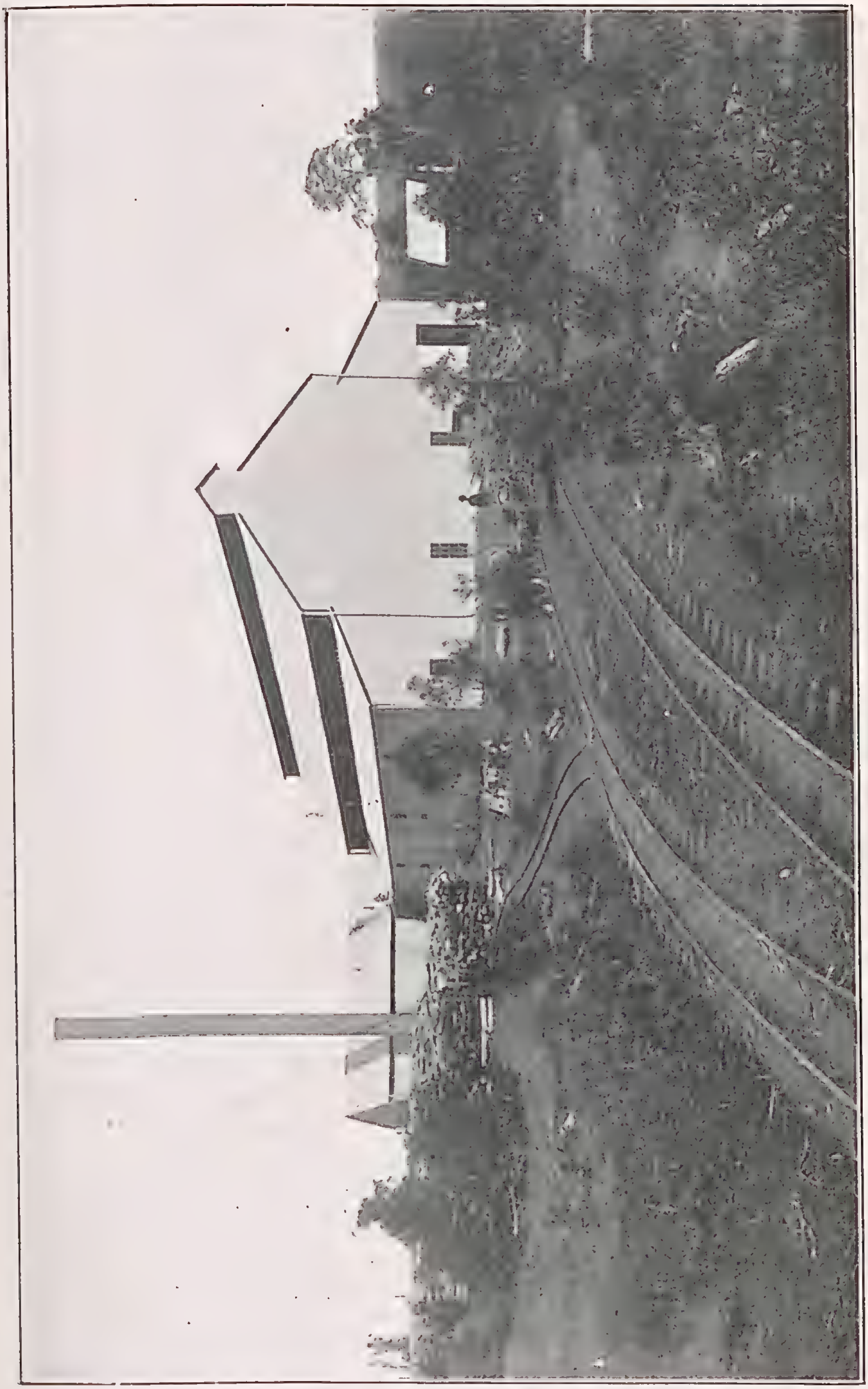


PLATE 1.—MORETON CENTRAL MILL, NAMBOUR, IN THE 'NINETIES.

William Broom said he was the original founder of the Yeppoon Sugar Plantation and commenced sugar cultivation in 1878, and still had a large interest in the place, but had been a heavy loser. If the plantation was not sold the unfortunates, of whom he was one, who had guaranteed about £16,000, would have to carry it on in the best way they could. He considered the mill and machinery had cost about £20,000. The manager of the Yeppoon Mill condemned white labour in no unmeasured terms; he said he would not invest a fig of tobacco in any plantation that employed white men; it was too unstable, and they had no command over it. He did not believe in central mills; they could have them where they liked, he did not care where, but they would not succeed with white labour unless they had a scrub like they had on the Johnstone and had a lot of farmers with big families growing cane and making slaves of their boys and girls. If in 1890 the importation of kānakas was going to stop, who on God's earth was going into the sugar industry with that hanging over them? The sugar industry would collapse.

Bundaberg.

Proceeding down the coast the next sugar centre visited was Bundaberg. Mr. M. Duffy examined, said he commenced business in 1878, and there were then just two mills working in the district, the average turnout being about 500 tons per annum in good seasons. When he retired from business in 1888, the output was 20,000 tons. The total tonnage of imports and exports for Bundaberg from April, 1878, to 1879 was 6,314 tons, while the total from April, 1887, to 1888 was 38,152 tons, not including imports of coal, which was 14,000 tons—Millaquin alone using about 13,000 tons. Continuing, he said he considered the sugar industry was in a precarious condition, there was no market in Queensland for the sugar produced, and it had to be sent to Sydney, Melbourne, and other places where it had to compete with other countries where they had the advantage of cheap labour in manufacture. That and the uncertainty of the labour question prevented banks and other firms financing plantations. The sugar industry had increased with great rapidity in Bundaberg; other businesses such as timber and maize had stood still. Before Millaquin had been established about eight years ago the very best land in the Woongarra Scrub was offered to him at £3 per acre; you could not buy the same land now at £30 per acre. When he arrived, there were only 300 people in Bundaberg, in 1888 there were 4,000 Europeans. He purchased an allotment in Bourbong street when Millaquin started, for £350; the actual value now (1889) was £4,000 to £5,000 without the buildings. If the sugar industry failed it would mean the collapse of the town, for there was nothing else to support it; the value of the export of sugar in 1888 was £300,000, which was six times the value of the whole of the exports put together.

Mr. F. L. Nott, of Windermere Plantation, gave evidence that the total area of the estate was about 1,500 acres, 670 being under cane. Last season he had crushed cane from 400 acres, and had sent 650 tons of juice to Millaquin, and had made 350 tons of sugar. This was a very heavy yield; it was all two or three-year old cane, every stick of it. This was the first season they had made sugar, and nothing had been done with the molasses, but they expected a distillery to be erected. About £50,000 had been invested in the estate; it did not return any interest in 1888 because they had just put in another crushing mill. If that had not been done they would have got about 10 per cent. The

working expenses in 1888 were about £8,000. They paid from £6 to £18 a year for coloured labour, with rations. European labour was very unsatisfactory in the field. There was a certain amount of labour in the field that the white man was not able to do. Kanakas would have to be employed in planting, weeding, chipping, trashing, and cutting. The machinery had been made principally in Maryborough, and had cost £15,000.

John Cran stated he was interested in the Millaquin Refinery, and in the year 1888 had manufactured 6,933 tons of sugar. The refinery had cost from £150,000 to £160,000. The expenses in 1887 had been about £60,000 for working expenses only, and did not include the amount paid for juice. They employed about 170 white men and about thirty-two Polynesians; the latter were time-expired boys who received 10s. a week and rations. The cost of the total overhaul at the refinery was from £2,000 to £3,000, the whole of such work being done by Europeans. The refinery had suffered very much from the depression due to competition with bounty-fed sugars from Continental countries, the great cost of labour in Queensland as compared with other sugar-growing countries, and they had also suffered very much from drought during the last five or six years. If some system of reciprocity could be introduced that would protect Queensland sugar against outside competition it would be a good thing, and the Queensland Government should encourage and assist the industry in every possible way by the inauguration of a scheme of irrigation similar to that so successfully carried out in America—that he considered the most important of all. If anything happened to the industry it would be very serious, and be absolute ruin to a great many; the sugar refinery rested altogether on the sugar industry, also the prosperity of Bundaberg to a very large extent indeed. He knew of no other crop that yielded the same return. They were proposing to build a juice mill in the Isis district—a very large scrub, some of it very rich. They did not have enough cane to keep their Yengarie Refinery employed fully during the season and could not support it for want of a large amount of cane. If they turned out 2,000 tons of sugar there would be a loss, whereas if they turned out 5,000 tons they would have a gain because the expenses of management and a lot of other charges were just the same.

They bought juice in Bundaberg; some cane would give 70 per cent. of juice, and another lot would only give 50 per cent. They had a complete system of piping for bringing juice from the various crushing mills to the refinery, pretty nearly 20 miles of pipe underground. The cane was crushed at the various plantations and the juice thus extracted is mixed with lime so as to preserve it. They mix the juice at the plantations, and take its density and pay the planters for the juice according to its density. It is then pumped through the pipes to the factory by force pumps. The farthest distance they had to pump from a crushing mill to the refinery was about 7 miles. They had reservoir tanks capable of holding 100,000 gallons, and during the crushing season these tanks were filled continuously; they worked the juice as fast as it came through and kept as little on hand as possible. The factory gave a large amount of employment to hands outside, and a very considerable number of farmers depended on Millaquin. They used about 14,000 tons of coal and 5,000 tons of limestone. They intended sending the juice by rail from their crushing plant in the Isis to Yengarie, and so would give employment to the Government railway.

Maryborough.

The Maryborough district was next on the list. Evidence was given concerning various small mills at Urangan and other parts of the district. Robert Cran, manager of Yengarie Refinery, stated he purchased juice from surrounding growers on the Mary River, and the juice was brought in by pipes or barges. Last year (1888) they had manufactured about 1,500 tons of sugar. About twenty-five canegrowers supplied juice. There were £100,000 invested in the refinery. Frosts destroyed a great deal of the cane.

A witness named Damm, examined at Pialba, said all the mills thereabout were not fitted for the manufacture of sugar at the price sugar then was. He had grown sugar and it was agreed that he should get 13s. per ton for 10 per cent. density. The millowner tested with a saccharimeter, but before doing so he used to mix the juice with rubbish, and so the instrument would not rise and only showed 5 per cent. If he had allowed it to settle it would have shown more. He was humbugged and only got 7s. a ton.

Southern Districts.

After leaving Maryborough, Thomas Laurence Smith, who died this present year (1931), was examined. He had a mill in the Rosewood Scrub at that time called Woodlands Plantation. This mill was afterwards known as the Marburg Mill. He had 1,200 acres of which 250 were under cane in 1888, but they did not crush owing to the dry season. He had invested about £20,000 to £25,000 in the mill, distillery, cane, and fencing. He had not got any interest on the money yet. In 1887 they made about 270 tons of sugar and 1,300 gallons of rum. They utilised all their molasses by making rum, and there was a good market. He employed niggers. He could get white labour, but it was no use when you did get it. One or two farmers grew cane for him; sometimes they would bring it to the mill and at other times they would not. He had a few white men in the mill and paid them the ordinary labourer's wage—viz., 4s. a day with no rations, but quarters found. When he started the plantation he got £22 for a low ration sugar. Now he had to sell refined sugar for £15 a ton. His mill could turn out 4 tons of sugar per day. He had shown farmers they could make £12 an acre by growing cane and only £6 an acre by growing maize. They were Germans, and they would not believe him.

A number of people interested in the small southern mills were also examined on the general lines indicated above, and a summary of these mills will be given, to avoid going into too much detail.

Mount Cotton Plantation.—Owner, H. Heinemann; output of sugar, 190 tons; amount invested, £5,000.

Eagleby Co-operative.—Output of sugar, 67 tons; cost of mill, £4,000.

Beenleigh Plantation.—Used to get £28 to £32 per ton for sugar, now only got £15 10s. Commenced to grow sugar-cane in 1866. In 1869 the yield was 4 tons of sugar per acre; the average now was about 2¾ tons. It took 14 to 15 tons of cane to 1 ton of sugar. £9,000 was invested, but they had now gone out of growing sugar.

It was stated in evidence that there were at one time a number of plantations about Beenleigh and Logan, but they had nearly all closed down. Junction Mill, Stegelitz, Otmoor, Rockholme, Helensvale, and a few others were still going. Other mills mentioned were Gramzow, Ageston, Ebenezer, and Norwell.

Brisbane.

At Brisbane, Edward William Knox, general manager of the Colonial Sugar Refining Company, stated the company owned three mills in Queensland—viz., Homebush, Victoria, and Goondi—which comprised about 38,000 acres. The total capital invested independent of interest on the outlay was £624,000. The whole of the sugar they made in Queensland was taken to Sydney, Melbourne, or Auckland. They paid £5 a ton duty in Sydney, and worked in bond and paid duty as it was taken out of the refinery. The company could afford to pay a much higher price for cane in New South Wales, as there was no excise duty. The largest quantity produced in one year in New South Wales was about one-half of the consumption of the colony. Asked if the diffusion process had been tried by the company, Mr. Knox said they had put down a plant for that purpose in New South Wales, and personally he was of opinion that the process would be universally adopted for the manufacture of sugar from cane where cheap fuel and a good supply of water could be obtained. Their working had only been experimental, but they were convinced that a larger quantity of sugar could be extracted from the cane by diffusion than by any other process, and he believed that the larger quantity of sugar would pay for the larger quantity of fuel when the cost of coal would not exceed from 25s. to 30s. a ton. Diffusion, however, could only be adopted at factories as now arranged by the expenditure of a large sum of money, and under present circumstances it would be out of the question to invest any additional capital in Queensland factories. The sugar industry was more depressed in Queensland than in other sugar-producing countries, because the cost of production was higher. They could produce sugar cheaper in Fiji, but the cane was not so sweet. Sugar had fallen from £10 to £12 a ton in Australia since 1884. At the present moment (1889) there was in Queensland ample machinery to manufacture a much larger crop. In Germany the yield of sugar from beets had been increased and cost of working lessened. In 1887, the yield of sugar throughout Germany was 1 ton of 88 per cent. net titre to 7·4 tons of beet. If the present Act (Abolition of Kanakas) was not repealed they would close two of their mills in Queensland, and the other would follow. They could find employment for the machinery either in Fiji or New South Wales. They were not prepared at that time to invest more capital in Queensland, owing to the uncertainty as to the supply of labour. Questioned as to the mills, Mr. Knox said there was double crushing at all their mills; they macerated the cane and all their work was carried out under chemical supervision. Speaking roughly, they obtained about three-fourths of the obtainable sugar from the cane. They put the molasses on their fields.

Abstract of Report of Commission.

In the report of two of the Commissioners, Messrs. King and Cowley, they state that the total area of land in Queensland on 31st December, 1888, under sugar-cane was 51,815 acres, which was one-fourth of the entire area cultivated in the colony. They estimated the capital invested in the sugar industry was about £5,000,000 sterling, the machinery alone representing a value of £1,000,000, while the annual expenditure was scarcely less than £800,000, and the value of the sugar exported was about £800,000. The number of Europeans employed was between 2,000 and 3,000, and the total number more or less directly interested, and

whose livelihood almost depended on it, could not be less than double that number. Seventy per cent. of the immigrants were engaged for the plantations and the number of Polynesians would be about 6,000. The wages of these amount to about £50,000 per annum, and of Europeans, not including managers, to £200,000. In the districts north of Rockhampton the farmers' produce is almost entirely consumed by the plantations, the number of horses that are being worked being enormous, averaging in many instances over a hundred on a single plantation. The effect of the depression had already been felt in the timber, iron, foundry, and shipping trades, sugar being the only article of agricultural produce of which any appreciable quantity is exported from the colony. The results of the Commission's researches fully justified its appointment and gave unmistakable evidence of a serious depression in the industry, and the necessity of immediately adopting measures for its relief. The most northerly plantation was that at Weary Bay in the Cook district (Bloomfield). That, after an expenditure of £100,000, was about to be abandoned. The only plantation in the Port Douglas district had ceased operations; Hop Wah at Cairns was abandoned, Pyramid Plantation was in the hands of a mortgagee, the pioneers having to relinquish it after spending £130,000.

On the Johnstone River there are four plantations, on one the mortgagee has foreclosed but is still carrying on, the others are not paying expenses though they are replete with every appliance for economical working. The Herbert River plantations are in no better condition; Gairloch has been sold and closed. The others failed to give any return on the capital invested. On the Burdekin delta there are three plantations, and there was another on which £200,000 had been expended but it was now closed. At Mackay there were twenty-two plantations with mills and two Government central mills. Evidence went to show that in no single instance either amongst farmers or planters was a profit being made, all being carried out at a loss. The town of Mackay was most seriously depressed in its trade and general business. In 1887, £284,829 worth of sugar was exported, and in 1888 this had fallen to £112,540 worth. At Rockhampton there is only one plantation (Yeppoon) now in existence. The Yeppoon Plantation was in liquidation and sold for £10,500, although £40,000 had been expended on it. At Bundaberg, affairs were somewhat different, there being forty plantations, twenty-two manufacturing plants, fourteen crushing mills, and one sugar refinery. This district showed evidence of a certain amount of prosperity and it was shown that in twelve instances interest ranging from 2 to 11 per cent. was paid on capital invested. In all other cases more or less loss was the result. The depression at Maryborough was most marked. In the Logan district it was found that many of the older plantations were abandoned, but some of the smaller were still in existence and growing cane; in some cases profitably, and in others affording the owners only a bare subsistence. We consider that the depression in the sugar industry is not attributable to the ignorance and incapacity of the planters as a body. They have shown on the contrary great enterprise. There was no doubt, however, that a large number of planters were seriously embarrassed. Since 1883, sugar of all classes had fallen in price fully 50 per cent., and there is no doubt that this fall, which was likely to be permanent, had been the principal cause of the depression of the sugar industry in Queensland; that is to say that if sugar had maintained its price the plantations would have well paid their owners instead of ruining them.

With reference to the question "Can sugar be grown in Queensland without black labour?" the colony must be divided into two sections—north and south. In the northern districts there was absolute unanimity that white men could not cultivate cane. In the districts south of Townsville, a different condition exists; here white labourers can do the work without such great danger to life or health, but they dislike the hand work in the field so much that they will not willingly undertake it. From the evidence laid before the Commission, it is concluded that sugar cannot be grown profitably, at least for export, without the employment for hand labour in the field of a class of labour cheaper and more suited for the work than white labour. The Commission went on to recommend that negotiations should be opened with the colonies of Victoria and South Australia for the purpose of ascertaining on what terms and conditions those colonies would admit Queensland sugars duty free, and they declared it was their opinion that if all coloured labour were withdrawn from the plantations the extinction of the sugar industry must speedily follow; and they therefore recommended that the introduction of Polynesian labour be permitted to continue, at all events for some years longer than the period then limited.

The opinion of the Chairman of the Commission, Mr. W. H. Groom, M.L.A., was expressed in a minority report. After traversing the conditions of the industry and the mills, he said that one of the suggested remedies for discussion, namely the extension of the Pacific Island Labourers Act for a further period of five years, opened up a very grave question of public policy, and a large majority of members had been returned to Parliament pledged to oppose the introduction of coloured labour and put a stop to its further introduction as early as possible. Those engaged in the sugar industry, therefore, asked the Parliament of the country to reverse its decision arrived at after mature deliberation on the part of the great body of the electors. The verdict of the electors was unquestionably adverse to the revival of the coloured labour question, and it was felt that a time would come when coloured labour would cease and all the industries of the country would be conducted entirely by white labour. Should Federation come about, the further admission into any colony of Asiatic or coloured races was definitely settled, because it would mean the exclusion of all such races. On the other hand if the question "Is Queensland able to do without the sugar industry except on the basis of a white population?" is answered in the affirmative, then undoubtedly a very large portion of the coast districts in the North would not be populated, at all events for a long time to come.

In Mr. Groom's opinion the causes of the depression in the sugar industry were—

(*a*) The unnecessarily large areas held by planters compared with the small area actually cultivated and the consequent payment of interest on the large unproductive area.

(*b*) The erection of mills quite disproportionate to the area of cane under cultivation.

(*c*) Sudden and continuous fall in the price of sugar arising from the keen competition of sugar produced from beetroot.

(*d*) Financial embarrassment of many planters owing to their working on borrowed capital bearing a high rate of interest.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

SUGAR-CANE TECHNOLOGISTS.

PORTO RICO CONFERENCE.

The Vice-Chairman of the Queensland Section of the International Society of Sugar-cane Technologists (Mr. H. T. Easterby) has been advised by the General Chairman of the Society (Dr. F. W. Zerban) that the Fourth Conference of the International Society will be held at San Juan, Porto Rico, in March, 1932. The meeting itself will last about one week, and will be followed by another week of excursions to plantations and other points of interest.

The Third Congress held, in Soerabaja, Java, was attended by delegates from fourteen different countries, and it is expected that the next one will be even more truly international in scope. Official invitations will be sent out during the summer.

There will be one or two meetings at which problems of general interest will be taken up, and then the Congress will divide into several sections, each one under a separate chairman, to discuss the various special branches of sugar technology, such as—

Protective sugar-cane quarantine,
Insect pests of sugar-cane,
Diseases of sugar-cane,
Varieties, including propagation and selection,
Cultivation and field operations,
Description and identification of the original cane varieties,
Soils,
Irrigation and drainage,
Technique of field experiments,
Factory operation and chemical control,
Uniformity in reporting factory data,
Forestry.

The technical committees having charge of these various subjects are to present at the meeting reports on progress made in their particular fields since the last Congress. These reports will be supplemented by brief individual papers relevant to the topics under discussion.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

A REMINDER.

The first of our monthly series of Entomological Notes of advice to canegrowers was published in November of 1923, and since that date these hints regarding the identification of common insects attacking cane, their probable times of occurrence, and approved methods of controlling their activities, have appeared regularly month by month in the "Queensland Agricultural Journal" and other periodicals.

The original purpose of the writer was to remind farmers of their responsibilities with regard to taking personal action against insects damaging their crops. Such attempts, if undertaken at the right time, will go far towards minimising the extent of injuries inflicted by our more serious cane insects, and would not trespass unduly upon the daily work of a cane farm.

Knowledge is power, and to be in a state of preparedness with regard to fighting those pests which are able, if unchecked, to cause material financial losses, should certainly give one a feeling of security when considering the possibilities of grub-infestation during the coming season. Thus, at the present time, it is advisable to look ahead and lay in adequate supplies of soil fumigants and other insecticides, in order to be ready to combat at an hour's notice the ravages of cane grubs, army worms, &c.

Be on the Lookout for Moth-Borer Damage.

During the next three months evidence of the presence of caterpillars of *Phragmatiphila truncata* Walk. will be noticed in localities where this moth usually occurs.

The tops of cane sticks nearing maturity are sometimes tunnelled, such injury resulting in many cases in death and browning of the unfolding central leaves.

These so-called "dead-hearts," which soon attract attention, are sometimes mistaken for evidence of fungus attack, but upon cutting through an affected cane-top one finds tunnels containing excreta, &c., that if opened up will be seen to harbour a smooth pinkish-yellow caterpillar about 1 inch long which, upon exposure to the light, wriggles vigorously and tries to fall to the ground. The basal and central portions of cane sticks are frequently tunnelled by this borer, such injuries, however, generally escaping notice unless severe enough to bring about discolouration of the heart-leaves.

The young shoots of plant and ratoon cane are most often attacked, and, as these are killed, "dead-hearts" soon become numerous throughout a plantation, and seldom fail to attract the grower's notice.

In cases where about 10 per cent. of stools happen to be affected, all shoots carrying "dead-hearts" should be cut out just below the injury and either crushed or burnt to destroy the caterpillars of pupæ of same which may be in the central tunnel.

Instances of severe infestation of this moth-borer should be brought under the notice of the Entomologist at Meringa.

Fighting the Weevil-Borer.

Watch the growth of cane on river flats where these beetles are likely to occur, and, if discovering evidence of the presence of this pest, communicate at once with the Entomologist at Meringa.

NUT CULTIVATION.

The Secretary for Agriculture and Stock, Mr. H. F. Walker, drew attention recently to the possibilities of nut growing as an adjunct to ordinary farming operations. The industry is as yet undeveloped, but judging from the numerous inquiries lately coming to hand for information as to cultural methods and sources of supply of plants, there is every prospect of a definite expansion. Judging further from the demand from overseas, there is on top of our own extensive absorption a good market in other countries, so there need not be (at least for a number of years) any fear of over-production. It is highly probable that the demand will greatly increase when it becomes more generally known what a highly concentrated, valuable, and healthful food the nut really is.

In this connection, it is interesting to quote the following from Dr. Morris's book on "Nut Growing":—

"Nuts furnish proteins of such fine quality that they supply the elements necessary to render more complete the proteins of cereals and other vegetable foods. They are free from such waste products as uric acid, urea, and carnine. Further than that they are nearly aseptic and free from bacteria of putrefaction at the time when they are eaten.

"One pound of walnut meats equals in food value 5 lb. of eggs, 9½ lb. of milk, or 4 lb. of beef loin. Each acre of walnut trees in full bearing will produce every year food approximating 2,500 lb. of beef, 3,500 quarts of milk, or 1½ tons of mutton."

The Queensland nut is also receiving more attention as an article of commerce, and already its cultivation is extending in California and other countries.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

COBWEB OR PINK DISEASE OF CITRUS.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

COBWEB or pink disease is a malady which has appeared rather extensively in some orchards of the coastal districts during the rainy seasons of the last few years. The disease is one which, if taken in time, need never cause serious loss, but which, if neglected, may easily do so. The following notes should enable growers to quickly recognise the disease and take the necessary precautions for its control.

Pink disease is not restricted to Queensland, but occurs widely distributed throughout most tropical and subtropical countries. It is found, for instance, in India, Ceylon, Java, West Africa, and the West Indies.

The cause of the disease is a fungous parasite (*Corticium salmonicolor*). This fungus is able to attack many different hosts, including among others such crops as rubber, cocoa, coffee, tea, mango, and citrus. In Queensland it has only been recorded in connection with the orange and mandarin.

Symptoms.

The grower is usually first informed of the presence of the disease on seeing the leaves on one or more branches wilting and turning brown. A somewhat similar effect might be expected from borer attack, but in the case of pink disease an examination of the affected region will reveal the presence of an area of grey or somewhat silvery growth extending over the bark of the affected branch near where it joins healthy wood. (Plate 2.) This growth consists of the mycelium or vegetative stage of the fungus.

In the early stages of the disease delicate cobweb-like threads are formed which extend out over the bark from the original point of infection up and down the branch. When not numerous it is difficult for the unaccustomed eye to pick them up. Some little distance back from their apex these threads usually become more numerous and aggregated together, so that they may finally form a thin silvery-grey weft completely covering the bark.

At first the fungus is entirely superficial in its growth, but eventually at some little distance back from the advancing margin the fungus commences to penetrate the bark and woody tissue of the plant, with the result that death of that section of the branch attacked occurs and the foliage of the outer portions consequently wilts. The fungus then gradually extends down the tree from the smaller to larger limbs, and if not checked in time may even reach the main trunk. Gumming is sometimes associated with the disease.

On old lesions the cobweb formation often becomes patchy and somewhat indistinct. However, another manifestation of the disease, known as the sterile pustule stage, may put in an appearance. This usually develops on the branch as it begins to dry out, and shows as small light-brown or faintly pink pustules of not more than one-thirty-second of an inch in height which burst through the bark over the affected region in more or less longitudinal rows. (Plate 3, fig. 1.)

No special function in the life history of the fungus can be attributed to these pustules, which merely consist of masses of aggregated or somewhat fused fungal threads. The presence of this stage is often of value in the ready diagnosis of old lesions.

PLATE 2.—THE COBWEB STAGE OF PINK DISEASE ON ORANGE BRANCHES.

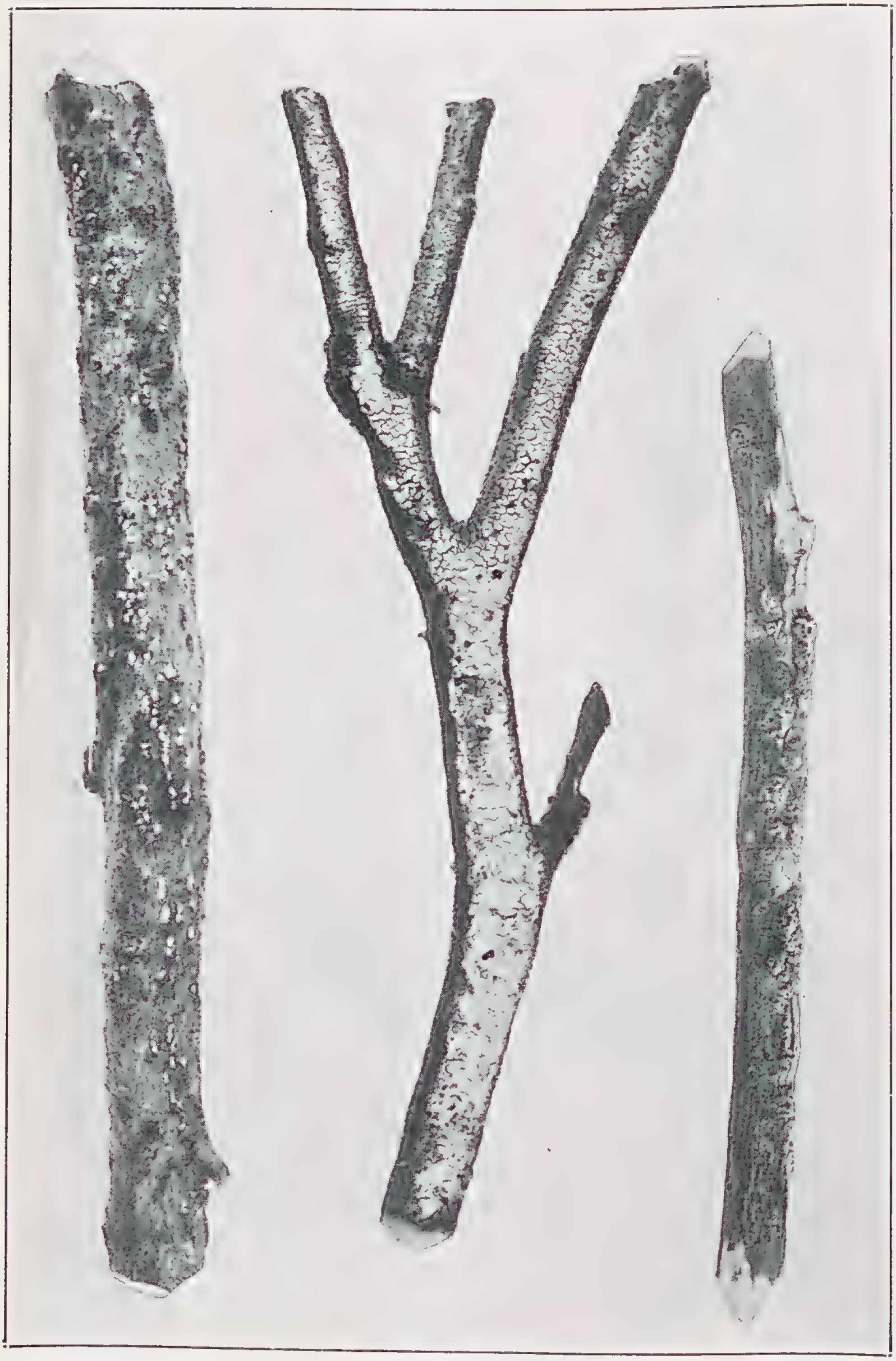


Fig. 1. *Fig.* 2. *Fig.* 3.

PLATE 3.—*Corticium salmonicolor* ON ORANGE BRANCHES.

Fig. 1.—Sterile pustuli stage.
Fig. 2.—Corticium stage.
Fig. 3.—Necator stage.

The most conspicuous and readily recognisable form of the disease is assumed during the fruiting stage of the fungus. It appears as a conspicuous salmon-pink encrustation covering the under surface of the dead branches. (Plate 3, fig. 2.) This only develops on the lower shaded and damp sides of the branches, and when looked at from the upper surface may be completely obscured. During wet weather the pink encrustation presents a comparatively smooth, felt-like appearance covering most of the bark irregularities. Afterwards as this dries cracks develop, with the formation of numerous small rectangular scales. In structure, this crust is formed of closely interwoven fungus threads. Certain special cells on the outer surface develop four peg-like projections, from which are developed delicate clear rounded spores. These serve as one means by which the disease is spread throughout an orchard. It is this stage which has led to the name of pink disease being applied to this trouble, but since the spider web-like appearance first described is often the only form met with in Queensland, the name of cobweb disease is also given.

The fungus has another method of bearing spores and so reproducing itself. This is known as the Necator stage. It is not very commonly found under Queensland conditions, but when it appears takes the form of orange-red eruptions through the bark, not unlike the sterile pustule stage except in their colour and somewhat larger size. From their surface numerous irregular cells are produced, which act as spores and serve to distribute the disease when washed or blown on to healthy branches where conditions are suitable to their development. (Plate 3, fig. 3.)

Control.

The essential factor in controlling this disease is not to delay treatment until it is too late. The fungus usually first infects a relatively small branch, but if unchecked will gradually work down to successively larger limbs until, as has been observed in some cases, the entire side of a tree may be lost.

1. Keep a careful watch during the rainy season for the appearance of dead or wilting branches. Examine carefully to see if cobweb disease or insect borer is present. If the former, remove the branch at least 18 inches below the last point at which the fungus or discoloured bark can be seen. This precaution is necessary, as the fine extending threads can be easily missed, and it is essential that none are left on the tree.

It is not advisable to merely scrape or paint the bark of affected regions, as the fungus in the majority of cases grows within the tissue only to reappear later.

2. Paint the cut end and about 18 inches back with tar. The tree should then be examined at subsequent intervals to make sure that complete eradication has been achieved, otherwise the process will have to be continued.

3. Any affected wood should be burnt.

4. If the orchard has been neglected so that the disease is present in its spore-bearing stages, protection may be afforded by covering the branches with Bordeaux mixture (6:4:40) to which a resin sticker has been added. This spray should be on the trees during the wet season when spreading of the disease takes place. It is, however, unwise to allow conditions to become such that spraying is necessary since Bordeaux mixture is liable to aid in an increase in scale infestation by destroying the useful fungi which parasitise these insects.

DISEASES OF THE PIG.*

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

[*Continued from the June issue.*]

PART VI.

In the preparation of information dealing with Diseases of the Pig, an endeavour has been made to describe in the simplest language possible the various conditions, abnormal and otherwise, associated with the incidence or appearance of disease in swine. The suggested preventive measures and methods of treatment are such as may be successfully carried out by any careful farmer, excepting only in cases where the services of a qualified veterinarian are advised, and in these cases the best methods to follow will be suggested on the spot by the surgeon himself.

The pig is notoriously a bad patient and a difficult animal to handle when indisposed, hence great stress has been laid throughout this treatise on the necessity of preventive measures, for prevention is not only much better than cure, but is invariably less costly and a great deal more satisfactory.

In dealing with methods of treatment and the engagement of qualified aid, it has been realised there are numerous difficulties in the way, because Departmental officers or practising veterinarians are not always immediately available in town or country districts. Again, therefore, we stress that prevention is better than cure, and we might even qualify this further by adding prevention is more necessary than cure.

Mr. Shelton's bulletin, representing as it does much labour and the fruits of careful study and observation, is a welcome contribution to current pig literature.—EDITOR.

COMMON DISEASES—A USEFUL CHART.

SOUND breeding stock, plenty of wholesome food, comfortable and clean accommodation, and good management are the best preventives of disease in pigs. Prevention is always better than cure, and the removal of possible causes, if at all possible, is the first step in the control of disease.

Disease, Nature and Causes.	Symptoms.	Prevention and Treatment.
Abortion.—The premature birth of the fœtus, due to injuries, exposure to cold, use of mouldy food; infection of the breeding organs by septic germs is also a frequent cause.	The expulsion of the fœtal pigs, which is sometimes preceded by a discharge.	Comfortable and clean conditions, quiet handling and good food help to prevent abortion. Affected sow should be isolated and the uterus flooded with a solution of 20 grains of premanganate of potash to 1 gallon of water to be followed by a douche of 1 teaspoonful of salt to 1 pint of water for five days.

* The typescript and illustrations of the Farmers' Bulletin on Diseases of the Pig have been submitted to the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., Department of Agriculture and Stock, Brisbane, Queensland.

Copies of the Bulletin when completed may be had gratis on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

In the compilation of this paper the writings of recognised authorities in other States and other parts of the world have been drawn on, and the assistance thus received, also that freely given by other Departmental officers, is acknowledged gratefully.

Disease, Nature and Causes.	Symptoms.	Prevention and Treatment.
Bronchitis is an inflammation of the bronchial tubes, the actual causes being germs, worms or dust; predisposing causes are damp, dusty, and insanitary conditions.	A persistent cough and slight fever with a progressive unthrifty appearance.	Provide sanitary and comfortable accommodation, use clean bedding in cold weather, give nourishing and laxative diet—milk, green food, and a little meal. Molasses helps to keep the bowels open. One dessertspoonful of Epsom salts with equal amounts of sulphur in the molasses daily for three days for every 100 lb. body weight is advised.
Indigestion.—A digestive disorder caused by improper feeding, coarse fibrous foods, weak washy swill or foods in a decaying or mouldy condition.	Loss of appetite, constipation or diarrhœa; tucked up appearance in the belly.	See that troughs are clean, change the food to rectify the fault, and give in the food a dose of castor oil, 1 or 2 ounces of oil to each 100 lb. weight of pig. Use light nourishing foods in well-balanced rations.
Inflammation of the Udder.—A disease of the udder, caused through injuries, or through suckers not relieving the sow of her milk.	Udder is hot, hard, and painful; sow refuses to allow pigs to suck.	Remove cause when possible, apply hot water foments to udder, massage the udder, using olive oil; give 2 ounces of castor oil in food. The massage of the udder is important. Use only light laxative foods and compel sow to take regular exercise.
Intestinal Worms.—Several species of worms are found in stomach and intestines. Large round worms (*Ascarids.*) are most common.	General debility, scouring, failure to make satisfactory gains in weight. The worms may be seen in the droppings and on post mortem examination.	Chief control measure is strict sanitation. Provide fresh pastures. Remove droppings and rubbish, clean troughs frequently, fill up all bog holes. Feed pigs on a laxative diet. Starve infested pigs for one day, then give in a small feed of milk half-a-teaspoonful of turpentine and 2 tablespoonfuls of castor oil for each 50 lb. weight of pig. Repeat a fortnight later. Worm capsules may be used in the treatment of these parasites.
Kidney Worms are an internal parasite which gain entrance through the mouth when pigs eat from unclean troughs and floors. They affect kidneys, liver, and other organs of the body.	General debility, pig tucked up in the belly, sometimes a staggering gait, general unthriftiness of the animals and failure to make satisfactory growth.	Eggs of worms are passed out with urine and the embryos hatching from the eggs are eaten by pigs. Sanitation is the chief control measure, administration of medicine is not recommended as these worms are not removed by medicine once embedded in organs of the body. Fill up mud holes, clean troughs frequently, and provide a rotation of grazing paddocks.
Lousiness. — Infestation by the common hog louse (*Hœmatopinus suis*) which is a blood-sucking parasite of the skin.	Pig rubs against posts. Skin irritated and may be scurfy and sore. Lice and nits may be seen on skin and hair.	Spray or wash pigs with a mixture composed of half-a-pint benzine, half-a-pint kerosene and 7 pints of waste oil; repeat application in three days and then one week after. Apply petroleum jelly or cocoanut oil to the skin. Provide a rubbing post around which is wrapped a strong bag firmly fixed and soaked in oil.

Disease, Nature and Causes.	Symptoms.	Prevention and Treatment.
Mange.—An infection of the skin, caused by the tiny mange mite burrowing into the tissues.	Irritation and scurfing of the skin. A reddened appearance not unlike severe sunburn.	Wash pigs thoroughly with a weak solution of coal tar disinfectant, then apply oil or sulphur ointment to the skin. Give more nourishing food and clean up the piggery by spraying with coal tar disinfectant solution all wood work and floors.
Necrotic Enteritis.—A serious disease caused by a germ which affects the lining membranes of the intestine and is responsible for the resultant inflammation.	Loss of appetite, increased thirst, fever, arching of back, diarrhœa; death usually occurs in a few days.	Prevention lies in clean and comfortable quarters and good, wholesome food; isolate affected pigs, destroy those that are seriously affected. Clean up and disinfect piggery. Change food to a light nourishing diet.
Paralysis of Hindquarters. — Cause often obscure and may be rheumatism, constipation, accident, kidney worms, lack of or deficiency in essential food elements.	Paralysis may be preceded by a wobbly gait and "marking time" with the hind feet, or it may be sudden. Pig eventually loses control of hindquarters, and drags the hind legs.	Remove any visible cause; correct any faults in feeding; feed plenty of green food and minerals, do not overfeed with maize. Allow pigs to graze in paddocks. When pigs are affected have them slaughtered under inspection at an abattoir or bacon factory, and follow the advice given by the official carrying out the examination.
Piles.—Protrusion of the rectum, caused through constipation and bad feeding. Overfeeding on milk products like buttermilk and whey is often responsible.	Constant straining, resulting in portion of the rectum protruding out past the anus. This is a very objectionable and serious complaint.	Isolate affected pig. Remove cause and give doses of castor oil, Wash protruding part in a weak disinfectant solution. Apply olive oil. Manipulate it back into place with the hands, reduce ration for a few days. If ration is cut down pig makes a good recovery if only 2 inches protrude.
Pneumonia. — Infection of the lungs by germs following exposure to cold, damp, and draughty conditions, and other predisposing causes such as lack of nourishing food and defective sanitation.	Loss of appetite, difficult breathing, coughing, nasal discharge, fever, and is specially noted by short jerky breathing and lack of appetite.	Provide clean and comfortable accommodation and bedding in sheds in cold or wet weather. Prevent draughts on pigs when camped in shed, run pigs in lots of less than 12. Isolate affected pigs, give a light nourishing diet such as whole milk. Destroy badly affected animals. Disinfect pens and troughs.
Poisoning—Due to eating arsenic, common salt, and other chemical poisons. Poisonous plants and weeds are also often responsible for fatalities.	Staggering gait, vomiting, abdominal pains, diarrhœa. Death sometimes sudden, sometimes there is a lingering illness.	Find cause of poisoning and remove it. Give purge of Epsom salts or castor oil. If the poison is known, give an antidote—antidote for arsenic is the anti-arsenic drench. Send specimens of suspected poisons, plants, or weeds for identification and when posting send a complete report to the Department of Agriculture and Stock, Brisbane.

Disease, Nature and Causes.	Symptoms.	Prevention and Treatment.
Rheumatism.—An affection of the muscles, caused through pigs lying on cold damp floors.	Intermittent lameness, swelling of joints, soreness of muscles.	Dry and comfortable sheds with a good sleeping floor; cement floors should be covered with wood. Use also clean straw bedding, particularly in cold and wet weather.
Rickets.—A disease of the bones of young animals, due to a deficiency of essential food nutrients, and to other causes such as neglected breeding, in-breeding	Hard swellings at joints of bones, Malformation of bones, staggering gait. Pigs affected are usually stunted in growth and make but little headway.	Allow pigs to graze on good pasture in clean paddocks. Do not feed too much maize or other concentrated grain foods. Always include some legume crop, such as lucerne, in the ration. Give pigs a supply of mineral food, such as charcoal, ashes, bone meal, and lime. Well-balanced rations in liberal supply with plenty of clean drinking water is very necessary.
Diarrhœa, White or Yellow Scours.—Common in young pigs suckling the sow. Due to over-feeding, bad foods, insanitary conditions, cold draughty sties; too liberal feeding of the sow is often the predisposing cause.	Frequent discharge of watery fæces of a strong smelling characteristic odour; pigs lose condition and fall away; deaths often result.	Clean up piggery and troughs, reduce sow's food supply considerably for several days; give the sow and affected pigs a dose of castor oil and add lime water to the food. Careful feeding is essential, clean up thoroughly, disinfect sties and floors, remove to clean pens and use plenty of clean, dry bedding.
Sore Mouth or Bull-nose.—A disease of young pigs caused by a germ and always associated with filth.	Swellings and sores on the nose and mouth, and general unthriftiness.	Clean up piggery and troughs, and use a disinfectant; allow sunrays to get into the shed and trough. Dip the pig's nose into a solution of premanganate of potash. This solution is prejudicial to eyesight as it destroys the cement substamce of the cornea.
Cannibalism — Sows eating their Young. —Caused through nervous excitement or the lack of some essential food element. It is sometimes hereditary and indicates a nervous temper.	Sows eat young pigs soon after they are born. It is usual for a sow to eat her afterbirth if she is permitted so to do, but it is unwise to allow her to have access to it.	Give pregnant sows good grazing, such as lucerne; give them protein rich foods such as milk, meat meal, or lucerne. Handle sow quietly at farrowing time. It is usually advisable to butcher a sow that has once eaten her young. Properly balanced rations in limited supply at farrowing time is essential; correct methods of management are advised especially at this time.
Tuberculosis.—A contagious disease caused by a germ.	Symptoms in the early stages are practically nil, in the advanced stages wasting of the body. Many pigs that are condemned show no external symptoms at all.	Pasteurise all milk products before feeding to pigs. Do not feed portions of diseased carcasses to pigs. Boil all meat before feeding to pigs. Disinfect troughs frequently, keep pigs in large, clean, and dry quarters. Destroy all pigs suspected of being tubercular. Get in touch with the Department of Agriculture and Stock immediately for advice as to how to proceed.

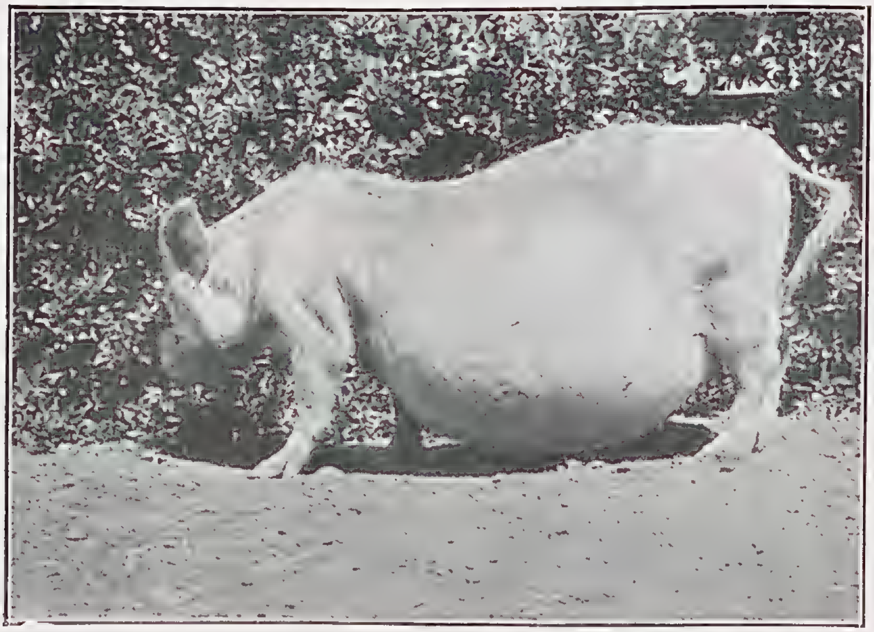


PLATE 4 (Fig. 1).

This middle Yorkshire Sow suffered from an uncommon disease, Dropsy of the Womb. She had a long and painful illness and finally succumbed. It is difficult to locate the cause of such a disease and still more difficult to effect a cure.

PLATE 5 (Fig. 2).

Another illustration of the sow shown in (Fig. 2). About 16 gallons of evil-smelling fluid was obtained from her abdominal cavity when the post mortem examination was conducted.

PLATE 6 (Fig. 3).—HAIR BALLS FROM STOMACHS OF PIGS AND CATTLE.

These hair balls, technically known as Trichobezoars are composed of fibrous matter, wool, hair and a certain amount of earthy matter. The top row were each about as large as a tennis ball, the middle row, from the stomachs of pigs (one or more in each), were about the size of a large oval cake of toilet soap, while the lower row varied from the size of a golf ball to slightly larger. The two to the left in the lower row were very light and were composed of earthy matter compacted together. Strangely enough the presence of these hair balls in the stomach does not appear to affect the general health of the animal. Hair balls are often found much larger than those illustrated.

It will be noted that no reference is made in this chart to such diseases as swine fever (often referred to as hog cholera), foot and mouth disease, or to other diseases responsible for losses in countries overseas. Fortunately, Queensland is particularly free from these diseases, but an ever-watchful eye is necessary if we are to remain free. Fortunately, quarantine regulations are sufficiently strict to protect the industry and check the introduction of diseased animals, but much remains to be done in the way of sanitation, improved methods of feeding, housing, and selection of breeding stock to place the industry on a permanently satisfactory basis.

PLATE 7 (Fig. 4).—PIGS IN CLOVER.

Pigs kept under conditions such as these have every possible chance to "make good." Liberal feeding on succulent pasture plus concentrated foods and clean comfortable accommodation are necessary for success in the raising of live stock.

As this chart is necessarily much abbreviated and incomplete, and does not include every known disease and is intended merely as a guide, further advice should be sought from the Department of Agriculture and Stock, either from Head Office at Brisbane or through field officers in the country, so that the required information may be obtained and suitable action taken to clear up diseases as quickly as possible. The Department has a liberal supply of printed matter available free upon application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland. Departmental officers will visit farmers where such visits can be conveniently arranged. Application should be made by letter if the services of an officer is desired.

POULTRY DISEASES.—II.

By P. RUMBALL, Poultry Expert.

On account of occasional heavy mortality among poultry flocks, and consequent economic loss, it is becoming more and more necessary to study and apply measures of disease control. Ever increasing competition and the need of keeping costs down to bedrock makes it imperative for poultry raisers to do everything possible to keep their fowls and runs free from disease and the conditions that create or add to the risks of the business. The loss of a few birds now and again might not be regarded as very serious, but in the aggregate such losses mean much to the industry as a whole.

In these notes, Mr. Rumball discusses ordinary poultry disorders in a practical way, and his views are therefore commended to our readers.—Editor.

APOPLEXY.

Cause.—The rupture of a blood vessel resulting in a clot of blood pressing on the brain substance, due to strain in laying (particularly with over-fat birds), injury to head, fright, and excessive use of over-stimulating food. Sometimes noticed with males at time of mating.

Symptoms.—The bird may be found dead under the roost. In most cases the symptoms are of short duration. The patient is seen to stagger and fall about, sometimes moving in a circle or backwards, pupils dilated. The trouble may be accompanied by convulsive movements of the limbs.

Treatment.—Keep the birds in good physical condition and cull rigidly over-fat birds and those that have a tendency to darken in comb, particularly when being handled.

BUMBLE FOOT.

Cause.—Collection of pus in foot may be due to a thorn or bruise. At times the trouble becomes prevalent in runs where the pus-forming organisms are present in extensive numbers, and also where the ground is rough. Bumble foot is more pronounced among Leghorns than any other variety of poultry in this State.

Symptoms.—Swellings noticed between toes and on the sole of the foot. The swelling may also extend partly up the shank. As the trouble advances the bird may become very lame and diarrhœa may set in.

Treatment.—In the early stages the painting of the swelling with iodine daily for a week may effect a cure. With advanced cases it may be necessary to follow the treatment by lancing and removing the collection of hardened pus, painting inside the wound with iodine and bandaging the foot.

BOTULISM.

Cause.—Poisoning due to an organism known as Bacillus Botulinus, found in spoiled food, liberating a toxin that affects the nervous system. There are several varieties of the organism.

Symptoms.—There is great prostration. At an early period the birds are inclined to mope about, but as the disease organism multiplies in the intestines there is an increase in the toxin given off, with the result that birds may be sprawled about the yard and unable to move.

Treatment.—Clean up any spoiled food, as well as dead birds, putrifying vegetable matter, &c., and administer Epsom salts at the rate of 1 lb. to each 100 birds. Burn all stock that have died from the trouble.

CANKER.

There are four forms of canker.

1. Small patches inside the mouth. This does not appear to spread to any extent from bird to bird, and causes little ill effect upon the patient.

2. A thick mass which penetrates deeply. This form is usually fatal and before death the bird becomes very emaciated. Advanced cases have been discovered in the flock and the disease does not appear to be highly contagious.

3. Canker may be noticed in the eye causing it to swell as in roup, but there is no discharge from the nostril. This is due to the invasion by a foreign body, and when this is removed the trouble subsides. Canker in the eye is frequently associated with the eye worm.

4. Chicken-pox canker.—This form is associated with chicken-pox. There is a discharge from the nose and frequently a swelling in the face. The trouble is highly contagious and spreads through the medium of the drinking and feeding vessels. The canker may extend to the windpipe or block the cleft in the roof of the mouth causing the bird to breathe through its open beak.

Treatment consists in removing the growth with a small smooth splinter of wood and painting the part with iodine or dusting lightly with powdered bluestone. Medication of the drinking water is desirable if the trouble is extensive in order to prevent as far as possible carriers spreading the disease. For this purpose copper sulphate (bluestone) will be found most effective. A stock solution should be kept on hand and used at the rate of ½ pint to every 4 gallons of drinking water. To make the stock solution, dissolve 4 ounces of bluestone in 1 gallon of water. This should be kept in an earthenware vessel or bottle. Care should be exercised in the use of bluestone as it is a poison. The quantity recommended should never be exceeded.

CONTAGIOUS CATARRH.

Contagious catarrh with its complications is one of the most widespread contagious diseases met with in poultry. It is caused by an ultra-microscopical or invisible organism. Some outbreaks are very mild, while others are very virulent. In many cases the disease organism is on the premises and its presence is only manifested when depressing conditions, such as wet, chilly, changeable weather, over-crowded, draughty, or insanitary houses, worm-infested stock, incorrect feeding, render birds more susceptible to outbreaks. The disease usually attacks young stock, but old birds are not exempt.

The mildest form is usually shown by a watery eye, one or both, and a discharge from the nostrils. After a few days this discharge thickens and one or both eyes are swollen. Where the disease is very virulent, in the early stages the eye is much inflamed, and as it advances the head becomes swollen, due to the collection of mucous in the orbital or ocular sinus or space. This swelling forces the mouth to be continually held open. There may or may not be diphtheric lesions in the throat or mouth. In order to clear its eye of the obstruction the bird wipes its head on its wing, shakes its head, coughs, and frequently scratches its eye.

Treatment.—There is generally fever which causes the birds to drink excessively, and as birds dribble when drinking the water becomes fouled. Owing to the contagious nature of the disease the water vessels can be considered one of the principal methods by which the trouble is spread from bird to bird, and to avoid this, medicating the drinking water should be practised. Copper sulphate (bluestone) is both economical and effective when used as advised for the prevention of canker.

Birds severely affected should be destroyed, and treatment only practised on cases which are mild or in the early stages. The disease being of a contagious nature, however, any birds kept for treatment should be isolated and the premises they came from thoroughly cleansed.

A teaspoonful of oil (cotton seed) containing three drops each of kerosene and eucalyptus oil could be administered daily to each bird. Eyes and nose treated by swobbing or by means of a syringe or small machine oilcan with either—

(1) Equal quantities of hydrogen peroxide and water;

(2) Ten grains of silver nitrate to the ounce of water; or

(3) Bluestone as recommended for medication of drinking water.

When eyes are much inflamed a few drops of a 10 per cent. solution of argyrol placed in them daily will be found very effective.

Any lesions in the throat could be painted with tincture of iodine or dusted lightly with powdered bluestone.

Preventive measures, however, should be adopted. Avoid the causes mentioned which predispose birds to infection. Use only sound and healthy breeding stock, and exercise due care when bringing fresh birds on to your premises.

CONGESTION OF LUNGS.

Cause.—Chills and exposure, especially in the case of moulting and young birds. Improper feeding and lack of exercise render stock more susceptible.

Symptoms.—The bird is sleepy and breathes rapidly, and in many cases with difficulty. Comb usually dark in colour. Post mortem examination reveals the

lung engorged with blood. This is due to the contraction of the blood vessels of the outer portions of the body forcing larger quantities to the internal organs. The disease usually runs a rapid course, and birds may be found dead in the pen that a few hours previous gave no indications of sickness. Death is due to asphyxiation owing to the inability to get enough air into the lungs.

Treatment.—No action apart from making the quarters as comfortable as possible appears to be economic.

CROP BOUND.

Cause.—Collection of fibrous material in crop, blocking the passage into the stomach or proventriculus. This collection may be straw, grass, or, in some cases, impaction has been due to twine used for binding hay. Birds that have been confined for some time and then given their liberty in runs in which the grass is long and coarse gorge themselves, with the result of crop binding.

Symptoms.—The crop is noticed to be distended, and on handling a definite hardness is felt. If the trouble is of a few days' standing there is a sour smell from the mouth and the bird may be more or less dark in comb and commence losing weight.

Treatment.—Make a slit in the middle upper part of the crop about an inch or more in length. Remove contents with the aid of a spoon handle or some other similar instrument, and sew up. Before sewing make sure that the passage into the proventriculus is clear. Sew the crop first and then the outer skin. A needle and white thread is all that is needed for the work, but it should be passed through the disinfectant that should be used for bathing the wound.

CROP PENDULOUS.

Occasionally birds are noticed with a large crop which is not firm. This is known as a pendulous crop, and is due to the weakening of the crop muscles resultant from errors in feeding, &c. The trouble is not serious, but if it inconveniences a valuable bird a sufficient area of crop could be removed. After the operation feed the bird sparingly for about a week.

CONSTIPATION.

Cause.—Lack of exercise, lack of green feed, heavy grain feeding, and digestive disorders.

Symptoms.—It will be noticed that the droppings are hard and firm and scanty, and to pass them the birds have to strain.

Treatment.—Give Epsom salts at the rate of 1 ounce to the gallon of drinking water, and feed green fed and other laxative foods.

DISTENDED ABDOMEN.

Hens with distended abdomens are not an uncommon feature in many poultry yards, and when such hens are noticed the cause should be ascertained, as this condition generally is not indicative of high production.

There are several causes of distended abdomen, and they may be grouped under two headings—viz., physical conditions and diseased conditions.

Physical Conditions of Enlargement.—Under physical conditions may be classed birds which are carrying an excessive quantity of internal fat. This fat is situated in a layer around the bowel or soft portion of the abdomen, frequently being an inch or more in thickness. Birds in this condition also have much fat upon the intestines and connective tissues, and this, together with the thick layer referred to, causes that swollen or distended appearance. This condition can easily be ascertained upon handling. The bird will be exceptionally heavy, and the thickened wall of the abdomen can be felt.

Another class of bird which comes under the heading of physical conditions is the bird in which there has been partial rupture of the membranes which hold the intestines in position. This ruptured condition allows the intestines to rest upon the soft portion of the abdomen, giving it that distended appearance. This condition is termed ''down behind'' and is easily ascertained by handling, the abdomen being soft and yielding, and by gentle pressure with the forefinger on one side and the thumb on the other the intestines can be felt.

This condition is more frequently met with in birds which are very short in the breast bone, and occasionally in excessively fat birds. The dragging and constant brushing with the legs against the abdomen often causes the formation of small

abscesses, but apart from that the constant irritation is sufficient to retard production. The evil of the short breastboned bird has probably been accentuated by breeders selecting birds which show great length of distance between the end of the pelvic bones and the end of the breastbone in their search for capacity, forgetting that in measuring the distance or depth of a bird on these lines, the angle on which the measurement is taken upon a short breastboned bird is greater than one with a relatively long breast, while the true depth may be the same. While the internal organs are held in position by membranes, and are not naturally dependent upon the framework of the body for support, in cases of fright, particularly when the hen is in full lay, the framework does act in this direction.

PLATE 8.—LARGE CYST IN WHITE LEGHORN HEN.
Note seat of attachment.

There is yet another class of bird which could be treated with under physical conditions, and that is one in which there has been a rupture or derangement of the reproductive organs. There are two principal forms of this trouble, one as illustrated and another where a distinct rupture occurs in the oviduct, allowing the individual egg to fall through into the abdomen. The condition of the oviduct as is illustrated is undoubtedly due to an egg becoming broken in the lower portion of the oviduct. This broken egg, by causing local inflammation, has prevented the eggs which followed from being laid, with the consequent packing up as illustrated. This condition, as will be noticed from the illustration, took some considerable time to form and externally the bird showed no signs of distress, looking all that a good layer should, the swelling of the abdomen being the only indication of possible trouble. If an examination had not been made the bird would not have been culled out, the oviduct becoming still more enlarged, possibly rupturing and allowing the mass of egg matter to fall into the abdominal cavity. Examination would indicate, when gentle pressure was exerted, a hardened mass, enabling the poultry-keeper to eliminate still another unprofitable bird.

Enlargement Due to Diseased Conditions.—There are two primary diseased conditions responsible for the enlargement of the abdomen—namely, abdominal dropsy and cystic diseases. With either of these troubles the hens affected will usually stand more erect than normally, and in advanced stages may be as upright as a runner duck. They become disinclined to move about, and when action is forced on them the comb becomes more or less dark in colour, and they experience

difficulty in breathing due to the pressure of fluid or cysts on the air sacs. In both cases the abdomen becomes very much enlarged and feels like a bladder of fluid. When pressed gently in one place there will be greater undulation in another, indicative of the presence of fluid. Judging from the abdomen alone it is difficult to distinguish dropsy from cystic trouble, but the breeder may be guided to a large extent by the condition of the bird. With abdominal trouble the bird generally becomes thin and emaciated, while the bird with cystic trouble is usually in good condition, particularly if the cyst is not of long duration. Dropsy is due to chronic inflammation of the liver or peritoneum, and the carcass is unfit for consumption. It is more frequent in old birds, particularly those that have been heavy layers, and in many cases it may be associated with internal tumours.

PLATE 9.—IMPACTION OF OVIDUCT.

Australorp hen, indicating how eggs and egg material may collect in the oviduct when the bird is egg-bound.

Cystic troubles are not infrequent in poultry. For every case of fluid due to dropsy coming under the notice of the writer there have been twenty or more due to cystic troubles. The seats of the cysts commonly met are in two distinct positions—namely, on the ovary and near the upper portion of the cloaca.

Cysts on the ovary vary considerably in formation. In some cases ovaries have been noticed in a general cystic condition, the cysts varying in size from a pea to that of an exceptionally large egg, and in others there has been but one large cyst similar to that illustrated in Plate 8. Ovarian cysts are probably due to the degeneration of certain cells. Poultry-keepers, however, need not be alarmed if one or two birds are found affected in their flocks, as no cases of general infection are known in this State.

Plate 8 shows a cystic formation situated at the upper portion of the cloaca. This is the seat of the majority of cysts coming under the writer's notice. They attain enormous dimensions, the one illustrated holding a little more than $1\frac{1}{2}$ pints of fluid.

Birds can be operated on for the removal of cysts, but the low value of the individual hen hardly warrants the labour involved. Breeders, however, who desire to remove cysts should take action before the cyst becomes too large, as when it is in this condition it is difficult to make an incision in the walls of the abdomen without puncturing the cyst. To operate, make an incision about 2 inches in length on the side of the bird, where the wall of the abdomen is thin. An effort can then be made to get a small portion of the cyst out. This now forms a neck in the cyst and with slight pressure upon the abdomen some of the fluid can be forced into that portion of the cyst outside, then more of the cyst withdrawn, and the process repeated until the whole of the cyst is removed from the abdominal cavity. The attachment between the cyst and the body can then be severed, the wound sewn up, and the operation is then completed. It will, however, be understood that all of this work should be performed under hygienic conditions. Operations have been performed on birds with cysts and their laying has not been interfered with, but in these cases the cysts were caught in the early stage.

[TO BE CONTINUED.]

A JOURNAL OF GREAT VALUE.

A Beaudesert farmer writes: "Your Journal, which I have been receiving for the past twenty years, I find of great value to the man on the land."

A Maroochydore producer: "Your Journal is much appreciated."

Two Home Hill canegrowers: "The Journal is doing yeoman service in the best interests of the man on the land."

A Mungallala farmer: "I find the Journal of great assistance."

PLATE 10.—BANANA GROVE AT BAFFLE CREEK.
A corner of Mr. C. W. Gurski's garden.

DAIRY FODDER PLOTS.

By A. E. GIBSON, Instructor in Agriculture, and C. S. CLYDESDALE, Assistant Instructor in Agriculture.

The subjoined notes have already appeared in the Journal (Part IV., Vol. XXVII.), and are reprinted in response to numerous requests from readers in several districts in the State. They are of particular interest and value at the present time.—ED.

THE majority of farmers engaged in dairying do not appear to realise the advantages to be gained by the growing of crops to supplement pastures to tide their stock over the leaner months of the year.

With the object of introducing the system throughout the Northern, Central, and Southern coastal districts, where reliance is usually placed on Paspalum, Rhodes, and other grasses, certain crop trials were instituted by the Department of Agriculture and Stock to determine the best single crops or crop mixtures for the purpose, and to demonstrate also that the methods, as practised, are not out of reach or too elaborate for the dairy farmer to undertake.

In Southern Queensland the undermentioned farmers co-operated in carrying out trials with Dairy Fodder Plots during the past season:—A. Hulse, Yandina, North Coast line; F. C. Burton, Bridges, North Coast line; and J. B. Stephens, Nindooimbah Estate, Beaudesert.

The soil on Mr. Hulse's farm is a deep, alluvial type of dark-grey loam, fairly rich in humus, which has been under crop, principally maize, for several years. That on Mr. Burton's farm is a deep, light-red coloured, sandy loam, which has been under sugar-cane for a number of years, and, consequently, somewhat deficient in available plant food. Mr. Stephens's property is composed of rich, black, alluvial soil, situated on the banks of the Albert River, and is practically new ground, having produced only two crops, subsequent to which it was fallowed during the Summer months.

No fertilisers were used on this occasion on any of the plots.

The rainfall recorded at Yandina Railway Station, which is ¾ mile from Mr. Hulse's, and 3 miles from Mr. Burton's property, was—

Month.	Points.	No. of Wet Days.
March	1,059	9
April	1,110	10
May	357	5
June	716	11
July	643	6
August	183	1
September	172	5

The rainfall for Beaudesert was—

Month.	Points.	No. of Wet Days.
March	487	13
April	453	13
May	213	11
June	792	9
July	652	6
August	31	2
September	205	12

Cultivation.—At Yandina the land occupied by plots was ploughed late in February, to a depth of 8 in., immediately after the removal of a crop of maize (grain), but turned up in a very rough condition; and later on, in March, was cross-ploughed and, prior to planting, was reduced to a fine tilth by means of the disc-cultivator, followed by the harrows.

At Bridges the land was ploughed and harrowed in March, and cross-ploughed and harrowed in May; these operations resulted in an excellent seed-bed.

PLATE 11.—PRINCE WHEAT AND VETCHES AT MR. A. HULSE'S FARM, YANDINA.

PLATE 12.—PRINCE WHEAT AND VETCHES AT MR. F. E. BURTON'S FARM, BRIDGES, N. C. LINE.

The plot at Nindooimbah was fallowed during the Summer, and before planting was again ploughed, thus making a perfect seed-bed.

Sowing.—The heavy rain experienced in March and April delayed planting operations. The soil was not dry enough to plant until 16th May, which, under the circumstances, was rather too late to expect early supplies of Winter fodder.

At all plots the usual local practice of broadcast sowing was followed, seed drills being unavailable. When used in mixtures, peas and vetches were sown first and "disked" in, the cereals being sown on the disked surface—once harrowed, and then rolled.

The majority of the plots made rapid progress, particularly the early-maturing varieties.

Description and Varieties on North Coast.—The two varieties of wheat experimented with—"Prince" and "Patriot"—appear to be suitable for the coastal districts, being practically free from rust, and made excellent growth. When harvested, they averaged 5 ft. in height.

Ruakura and Algerian oats suffered considerable damage owing to excessively wet weather, causing them to lodge, and to be badly affected by rust. They reached a height of 3 ft. at time of harvesting.

Skinless barley suffered badly from the effects of rust, which appeared when the crops were 2 ft. high, in the "shot blade" stage.

Cape barley did fairly well, and when harvested averaged 4 ft. in height, producing a large amount of foliage, and showing only slight indications of rust.

Rye made quick growth, looked remarkably well throughout the growing season, and, when harvested, averaged 5 ft. in height.

In all plots the field peas did remarkably well, making vigorous growth throughout, and, when harvested, averaged 4 ft. 6 in. in height.

Vetches, which are usually rather slow in growth, produced a fair amount of foliage, and, when harvested, averaged 4 ft. in height.

Plots at Nindooimbah.—Throughout the plots, peas and vetches were considerably overgrown by the other cereals used, thus affecting the subsequent yields of fodder. The varieties of wheat—"Prince" and "Patriot"—made excellent growth, stooling well, and having but slight indications of rust. Although they were knocked about considerably by wind and rain prior to harvesting, they did not suffer any serious damage.

[The varieties of wheat mentioned in the foregoing (Prince and Patriot) are now somewhat difficult, if not impossible, to obtain, but Warren and Warchief—two well-known wheats at present in use throughout the wheat-growing areas of Queensland—may with confidence be recommended as substitutes.

Similarly, Sunrise oats may be substituted for Ruakura, a variety of oats not always readily obtainable.—Ed.]

Skinless and Cape Barley.—During the early stages of growth, these varieties suffered damage from excessive rains, which caused them to lodge; opportunity was taken to make a first cutting, this being effected ten weeks from the date when the young plants first appeared above the ground. A subsequent cutting was made at a later date, details of which appear in tabulated form. Cape Barley made most remarkable growth, but that of "skinless," subsequent to the first cutting, was somewhat thin.

Ruakura and Algerian Oats.—The former, being much the earlier of the two varieties, stooled well, and resulted in a much heavier growth. Later on, however, it showed an inclination to lodge, and to rust. The Algerian oats were somewhat later in maturing, but stooled well; this crop also showed an inclination to lodge, and a susceptibility to rust.

Rye.—Owing to its early-maturing habits and favourable conditions, the rye made rapid growth, and was harvested on 13th August, averaging 5 ft. in height at the time.

By using a little judgment in selecting the right varieties to grow, and getting the first sowing in, say, towards the end of March or April, a plentiful supply of green fodder should be available from early August until practically the end of October, by which time the Spring growth in pastures should be well advanced.

In all plots, each of which contained one-tenth of an acre—

Wheat was sown at the rate of 60 lb. per acre.
Barley was sown at the rate of 50 lb. per acre.
Oats were sown at the rate of 40 lb. per acre.
Rye was sown at the rate of 60 lb. per acre.
Field peas were sown at the rate of 30 lb. per acre.
Vetches were sown at the rate of 20 lb. per acre.

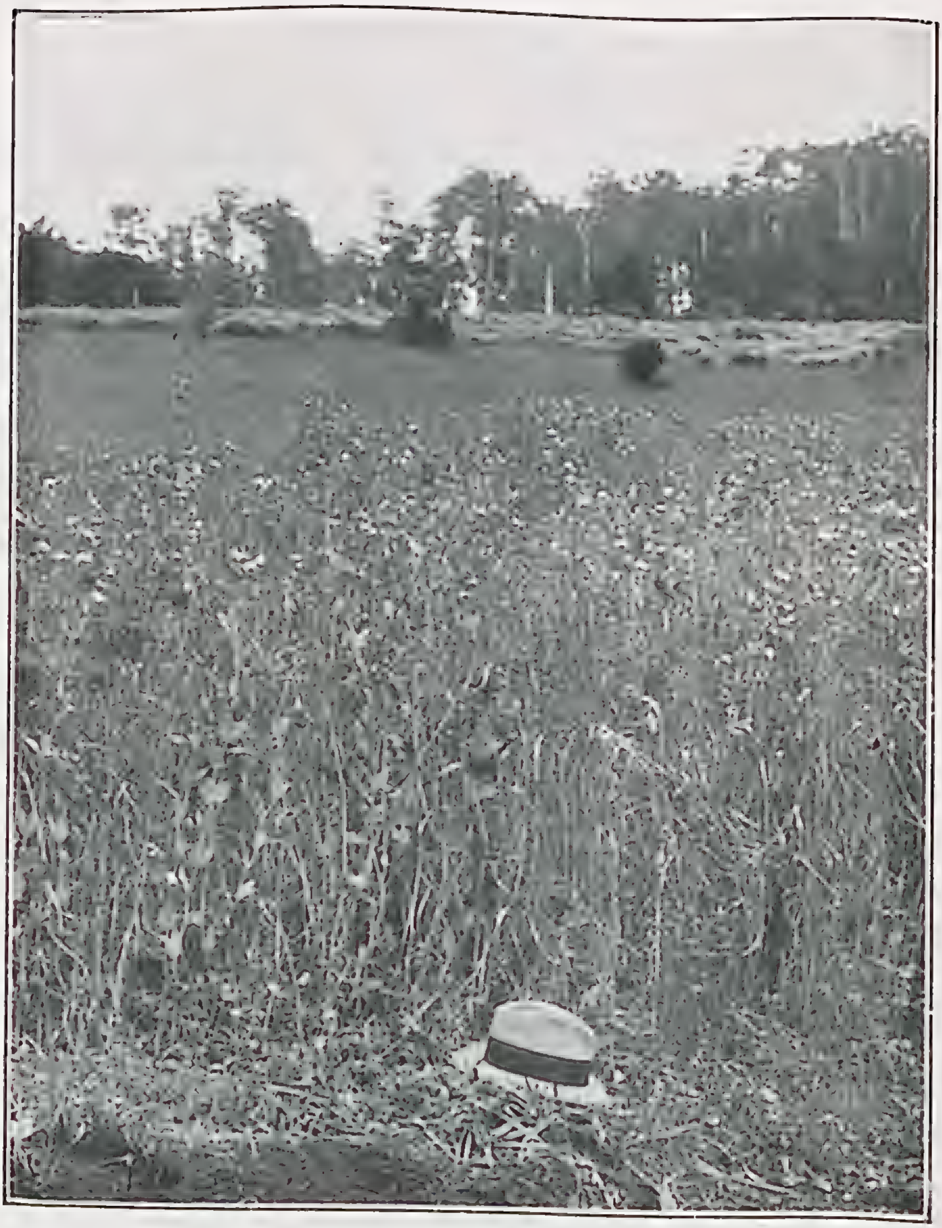


PLATE 13.—PATRIOT WHEAT AND FIELD PEAS AT MR. F. E. BURTON'S FARM, BRIDGES, N. C. LINE.

Plate 14.—Kudzu Vine (Fodder Plant), at Mr. H. M. McMartin's Farm, Pullen Vale.

RESULTS.

Varieties.	YIELDS PER ACRE OF GREEN FODDER.											
	A. Hulse, Yandina.				F. G. Burton, Bridges.				J. B. Stephens, Nindooimbah.			
	T.	C.	Q.	LB.	T.	C.	Q.	LB.	T.	C.	Q.	LB.
Prince wheat and peas	16	16	2	12	2	14	0	2	13	10	0	10
Prince wheat and vetches..	10	16	0	8	6	1	2	4	11	17	2	20
Patriot wheat and peas	16	4	0	12	9	2	0	0	14	0	3	16
Patriot wheat and vetches	11	6	3	4	2	0	2	1	12	18	1	26
Rye and peas	10	16	0	8	5	5	1	9	14	11	2	22
Rye and vetches	7	11	1	0	Destroyed by wallabies				16	4	0	22
Cape barley and peas	12	3	0	9	10	16	0	8	13	10	0	10 (two cuttings)
Cape barley and vetches	7	11	1	0	2	19	1	19	15	2	2	0
Skinless barley and peas	11	6	3	14	Destroyed by wallabies				5	18	3	10
Skinless barley and vetches	5	13	1	21	Destroyed by wallabies				5	2	2	15
Ruakura oats and peas	9	9	0	7	4	3	2	25	18	18	0	14
Ruakura oats and vetches	7	11	1	0	Destroyed by wallabies				17	16	2	2
Algerian oats and peas	8	18	1	1	3	6	0	19	9	3	2	18
Algerian oats and vetches	6	15	0	5	Destroyed by wallabies				9	14	1	24

The yield generally on Mr. F. G. Burton's plots were reduced by the depredations of wallabies.

PLOTS AT TOOGOOLAWAH.

For some years the Department of Agriculture has endeavoured to interest dairymen and stockowners generally in the matter of fodder provision for their herds during those periods when, by reason of the lack of succulence in the natural pastures, yields from their herds have been considerably lessened, and, in some cases, even reduced within measurable distance of vanishing point.

The practice of arranging with interested farmers to carry out trials designed and supervised by officers of the Department, has met with a good deal of success. The results to date have clearly shown that by early and careful preparation, heavy returns are readily available of rich, succulent, milk-producing fodders, and that a continuity of this class of food can in normal seasons be kept up to tide milch cows over periods during which their productivity is affected by the gradual depression, induced in each animal's system, by being called upon to make use of rough grasses of low nutritive value, at a time when weather conditions were at their worst.

Ocular evidence has shown that improved milk supplies and a correspondingly improved return from the factory is inducement enough for other neighbouring farmers to profit by the example of the one who first adopted the system of growing crops regularly, for his dairy stock—actually, on a farm, an inexpensive method of maintaining an income.

In the present crop trials carried out on Mr. T. Coleman's property at Toogoolawah, no fertilisers of any kind were used. The plots were situated on well-prepared alluvial soil near Cressbrook Creek, which had been under cultivation for a number of years.

The plots were sown on 31st March, 1925, and were harvested for yield-computing purposes on 30th July, 1925, consequently each yield submitted represents four months' growth of fodder, and judged on this basis may be considered as highly satisfactory.

A more vigorous growth was noticeable in the case of Florence wheat and peas or tares and the Skinless barley with a similar mixture, both of which were well out in ear and rapidly maturing; rye had made a dense growth in both instances, but only a few heads were to be seen, and probably a further three or four weeks would be

required to bring it to a similar state of maturity to that obtained by the Florence wheat at date of harvesting. The following yields were recorded:—

	Per acre. Tons.	cwt.	qr.	lb.
Florence wheat and peas	7	14	1	4
Cape barley and peas	9	11	1	0
Skinless barley and peas	10	15	1	0
Rye and peas	8	10	1	12
Algerian oats and peas	8	3	3	20
Canary seed and peas	11	8	0	24
Florence wheat and tares	7	4	2	16
Cape barley and tares	9	0	0	0
Skinless barley and tares	11	1	3	4
Rye and tares	12	13	3	20
Algerian oats and tares	10	15	1	12
Canary seed and tares	8	10	1	12

PLATE 15.

FLORENCE WHEAT AND TARES. Yield—7 tons 4 cwt. 2 qr. 16 lb. per acre.

In view of the fact that some of the plots might be regarded as too immature for the purpose of obtaining the maximum yield, further weighings for comparative purposes were made on the 24th August, with the following results:—

	Per acre. Tons.	cwt.	qr.	lb.
Algerian oats and peas	11	9	3	12
Rye and peas	8	13	2	8
Canary seed and peas	7	17	2	0
Algerian oats and tares	13	19	2	6
Rye and tares	9	9	2	16
Canary seed and tares	13	14	3	8

When selecting fodders for the test, cognisance was taken of their respective periods of maturity so that a continuity in the supply of green fodder might be kept up. Obviously the grower by using judgment in the matter of arranging for succession sowings should readily be able to maintain his supplies, and in this way ensure a more regular state of productivity in his herd.

Observations made respecting the period of development of the different crops were as follows:—Florence wheat and Dun field peas were ready for use earlier than any other single crop or combination, followed by crops in the order named: Florence wheat and tares, Skinless barley and peas, Cape barley and peas, Skinless barley and tares, Cape barley and tares, Rye and peas, Rye and tares, Algerian oats and peas, Algerian barley and tares, Canary seed and peas, Canary seed and tares.

Observations made indicate that it is advisable when arranging for mixtures of crops to confine the sowing of peas to the early-maturing cereals—Florence wheat, Skinless and Cape barley—as the peas begin to lose weight as they approach maturity.

PLATE 16.

FLORENCE WHEAT AND DUN FIELD PEAS. Yield—7 tons 14 cwt. 1 qr. 4 lb. per acre.

Tares on the other hand have a longer growing period and retain their succulence better than the field peas, consequently they are more suitable for use with Algerian oats, Canary seed, and Rye.

To those dairymen who are interested in maintaining supplies to their respective factories throughout the winter period, the following quantities are recommended for use in connection with the above class of fodders:—

Wheat 30 lb., Dun field peas or Black Tares 20 lb.
Barley 40 lb., Dun field peas or Black Tares 20 lb.
Rye 30 lb , Dun field peas or Black Tares 20 lb.
Oats 30 lb., Dun field peas or Black Tares 20 lb.
Canary seed 10 lb., Dun field peas or Black Tares 20 lb.

DRY SEASONS—A COUNTERING FIELD CAMPAIGN.

The loss of national wealth to this State brought about by periods of drought cannot be accurately estimated by figures—but their effects are undoubtedly far-reaching. If action can be taken over certain areas whereby increased production can be brought about, it naturally follows that dry periods are robbed to some extent of their devastating influences and the loss to the State as a whole is decreased. A policy of this kind is naturally educative in its character to all, but when certain sections are dealt with it becomes more particularly of value to those directly interested, and this is increased when illustrations are given for the purpose of proving the policy advocated.

For some time past the Department of Agriculture and Stock has interested itself in increased production of dairy and allied products, and with this object in view has initiated a series of fodder trials in various districts for the purpose of pointing out that if means are adopted for the annual provision of fodder crops for dairy stock and pig raising, the fluctuations which have in the past taken place in the supply of these products will be considerably reduced if not entirely removed.

PLATE 17.

CAPE BARLEY (in short blade stage) AND DUN FIELD PEAS.
Yield—9 tons 11 cwt. 1 qr. per acre.

During the past few months the losses to dairymen and others, brought about by lessened production resultant of the dry period experienced, amounts to a considerable value, and attention is drawn to the fact that these can be considerably reduced by adopting the policy of careful soil preparation and the sowing of crops calculated to fill the void caused by the absence or decreased supplies of natural grasses and herbage.

It was with such an object that dairy and pig fodder trials were established on the farms of Messrs. F. W. Thiedeke and Peel Caswell, of Beaudesert and Wangalpong respectively, and results obtained so far from portions of these plots

PLATE 18.—PEAS AND PILOT WHEAT AT BEAUDESERT.
Weight 10 tons 17 cwt. 2 qr. 19 lb. per acre.

PLATE 19.—PEAS AND FLORIDA WHEAT AT BEAUDESERT.
Weight—11 tons 17 cwt. 2 qr. 20 lb. per acre.

PLATE 20.—PILOT WHEAT AND PEAS AT P. CASWELL'S, WANGALPONG (FODDER PLOTS).

PLATE 21.—FLORIDA WHEAT AND VETCHES AT P. CASWELL'S, WANGALPONG (FODDER PLOTS).

have proved the soundness of the principle involved. Both farmers are capable agriculturists whose methods of cultivation leave little to be desired, and who are fully seized of the importance of fallowing and thoroughly preparing their land prior to seeding operations. The results obtained on the comparatively low rainfall experienced at Wangalpong speak for themselves; and whilst the soil at Beaudesert is of a heavier nature than that met with in parts of the Canungra Valley, the heavier rainfall experienced more than compensated for the difference in soils and their moisture-retaining qualities.

The plots were planted on the 9th and 10th June at Mr. Thiedeke's at Beaudesert, whilst those at Mr. Caswell's, at Wangalpong, were planted on the 12th and 14th of June, rainfall experienced between the 9th June and 23rd September (the date of harvesting) at Mr. Thiedeke's being 3.66 inchs, but it must be noted that a fall of 1.06 inches was experienced on 7th June, two days prior to planting. At Mr. Caswell's the rainfall received between the 12th June and 24th September totalled .91, the previous rains to that date being 1.25 inches, registered on 14th and 17th May.

The following weights of green fodder were recorded:—

	Mr. F. W. Thiedeke, Beaudesert.				Mr. P. Caswell, Wangalpong.			
	Tons	cwt.	qr.	lb.	Tons	cwt.	qr.	lb.
Florida wheat and peas	11	17	2	20	7	6	1	22
Florida wheat and tares	10	8	3	13	7	4	0	5
Pilot wheat and peas	10	13	2	19	8	5	2	17
Pilot wheat and tares	10	4	0	7	6	12	0	5
Skinless barley and peas	11	8	0	8	6	4	3	10
Skinless barley and tares	4	16	0	3	7	1	2	16
Cape barley and peas	6	2	1	21	4	18	1	20
Cape barley and tares	9	7	1	1	4	16	0	3
Rye and peas	5	15	0	27	4	16	1	20
Rye and tares	8	0	3	11	3	7	0	25

The varieties of wheats used in the trials were Pilot, a Bunge-Florence crossbred, and Florida, a Bobs-Florence crossbred, both of which were raised at Roma State Farm. These varieties made excellent growth, and were remarkably even throughout the trials. At the time of harvesting both varieties were in the flowering stage, averaging 3 feet 6 inches in height.

At Wangalpong both Pilot and Florida showed signs of flag-rust, but at Beaudesert no signs of rust were apparent. This was probably due to local conditions and to the fact that humidity in the Canungra Valley is greater than in the more open areas around Beaudesert.

Cape Barley.—This crop made fair growth and when harvested was in the shot-blade stage—the height averaging 1 foot 9 inches of good healthy growth. From the general appearance of the crop a later cutting will give a heavier yield.

Skinless Barley was a clean and attractive crop, averaging 3 feet in height, which had made a remarkable growth of foliage. When harvested the grain was in the soft dough stage.

Rye.—In each case this crop made rapid growth, and was in the flowering stage when harvested, averaging 3 feet in height. Generally speaking, growth was somewhat on the thin side, and heavier quantities of this cereal should be sown when the season is somewhat advanced, as it was in this particular instance.

Field Peas in all plots made fair average growth of 1 foot 6 inches in height. When harvested they showed signs of wilting, thus reducing the weight per acre that under other conditions would have been recorded.

Vetches, usually rather slow in maturing when compared with peas, made favourable growth.

The pig fodder plots were not sufficiently far advanced in growth on 23rd September to justify their harvesting, consequently this matter was deferred till 24th November, but during this period a further rainfall of 326 points was received and recorded as follows:—25th September, 32 points; 28th September, 166 points; 16th October, 46 points; 25th October, 9 points; 16th November, 73 points; total, 326 points.

As a result increased growth was in evidence compared with that shown on the occasion of the previous visit.

As in the case with the dairy plots, Mr. Caswell had given careful attention to the cultivation of the various fodders, and an entire absence of weed growths was noticeable.

The various yields recorded can be regarded as valuable illustrations of what can be accomplished by careful and systematic cultivation of crops that are suited for purposes of economic pig-feeding and can be produced at little cost to the grower.

The following are the yields recorded:—

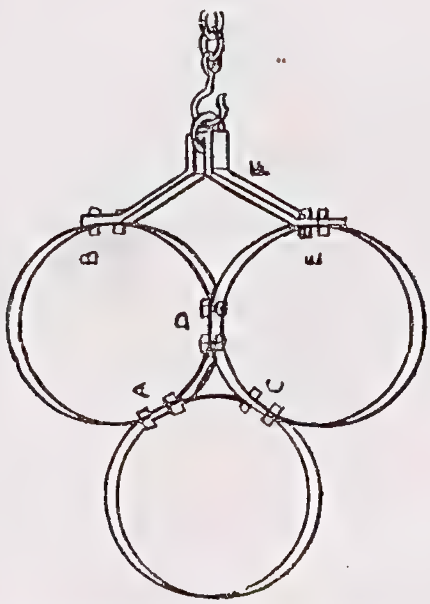
	Per acre. Tons	cwt.	qr.	lb.
Thousand Headed kale	11	15	3	3
Dwarf Essex rape	6	9	2	16
Yellow Globe mangels	29	8	1	20
Long Red mangels	23	19	2	12
Purple Top Swede turnips	14	18	0	27
Elephant Swede turnips	12	13	3	18
Sugar beet	17	6	2	12
White Belgian carrots	12	13	3	18

The Dwarf Essex rape suffered somewhat from the attacks of Aphis, whilst the foliage of the Swede turnip was subjected to the attentions of the Rutherglen Bug; otherwise the crops were excellent in every respect.

LAND LEVELLER FROM OLD TYRES.

"I wonder if many of your readers know what an excellent clod-crusher and leveller three old wagon wheel bands or tyres will make?" asks a correspondent of the "Farmers' Weekly" (South Africa). There are generally some lying about most farms, or which otherwise could be had for a few shillings from the nearest blacksmith. They are put together in an hour by any handy man as below.

All that is required are three old wagon wheel bands, ten short, stout bolts, and a piece of, say 1½-in. by ½-in. flat iron to which to hitch the bands. The length of iron required for the hitch will vary somewhat, according to the diameter of the tyres used. It must be given an upward bend to allow the implement to run flat when travelling.



If a large leveller is wanted, hind-wheel bands are used; if smaller, front-wheel bands.

This leveller is an excellent clod-crusher, as being heavy the clods are rolled in front of it till they are pulverised. Being rigid and broad, the leveller does not sink into the hollows on the land, but shears off the bumps and automatically deposits the soil in the hollows. Going over the land twice with this implement leaves the land perfectly smooth, without those bumps and hollows so annoying in irrigation.

Photo.: F. W. Thiel.]

PLATE 22.—HON. R. M. KING, DEPUTY PREMIER, AND ACTING MINISTER FOR AGRICULTURE AND STOCK.

Mr. King, Deputy Premier, Minister for Works and Education, and Acting Minister for Agriculture and Stock, is a native of Brisbane, being a son of the late T. M. King, I.S.O., who at different stages of his career was Auditor-General and Commissioner for Railways. Mr. King was educated at the Brisbane Grammar School, at which he was a scholarship-holder. After leaving school, he took up the study of law, and was admitted as a solicitor of the Supreme Court in 1893. He has been practising his profession ever since, and is a member of the firm of King and Gill, of Brisbane. In 1920 he was elected to represent the Logan in the State Legislature. When the National and Country Party sections came together on a common policy, Mr. King was elected deputy to his leader, Hon. A. E. Moore.

His chief hobby is yachting, but in his younger days he was well known on the cricket and football fields. Tennis and golf also claim him as a devotee.

BLOWFLY IN SHEEP.

By J. CAREW, Senior Instructor in Sheep and Wool.

WITH the advent of a fair summer rainfall and the gradual increase of the fly, no opportunity should be lost in getting the sheep fit for the resistance of any attack. In accordance with previous observations, their actual numbers do not indicate the intensity of infestation, but rather that they work up to intensive attacks by waves. Each species predominates in the adult stage at definite periods peculiar to itself, and some of these species indicate that they cause more serious effects than others, even when smaller numbers are present.

Since the experiments at Dalmally were discontinued in 1923 very little, if any, progress towards either control or prevention has been made.

Parasites, either internal or external, render the sheep more prone to fly attack. Internal parasites, especially stomach and intestinal worms, are the worst offenders, for when they become troublesome they cause derangement of the digestive organs, resulting in mild to severe scouring according to the severity of attack. This scouring will develop whether the sheep are on a scanty pasture or not, with the result that if flies are present the scouring sheep affords a suitable striking medium.

If the feed is green and plentiful the exereta of the sheep is likely to become soft and adhere to the wool. If a few flies are about after the first rain an increase can be expected, but, by the time they become numerous, if the wool and dags are dry no serious attack can be expected, but should a shower of rain fall and these dags become damp a serious attack may occur. Should the sheep be crutched, shorn, dipped, or jetted beforehand, much trouble is saved and probably no complete

PLATE 23.—A CASE FOR TREATMENT.

estimate of the advantage derived from the operation, whichever it may be, is realised. Should the sheep be in half wool or longer when the attack occurs, the quickest way of giving protection is the most satisfactory, for once a sheep is struck other flies are attracted, probably resulting in a severe infestation in a few days. Other sheep in the flock may be struck, but any mustering where clean sheep are brought into contact with those that are blown only encourages further trouble unless the flies are destroyed or the sheep protected.

Jetting or Dripping.

Jetting or dipping suggest themselves, for either of these methods, if properly done, will kill the maggots on the sheep as well as poison many of the flies that are attracted by the moisture in the wool. The two chief points to be considered are to see that the poisoned liquid penetrates to the skin and that it is of the desired strength.

Jetting is performed by forcing the prepared liquid through a nozzle into the crutch of the sheep. The area that should be jetted as a safeguard against the attack of the fly should be over a space extending from above the tail and carried down at each side of it to the crutch, which should take in all the stained portion. Length of wool or the presence of dags does not matter, provided the mixture is forced to the skin. The long wool will hold more poison, thus giving a greater amount of protection. Sheep that are struck should be jetted without being crutched. When the sheep are returned to their pasture, if time permits those showing distress may be given any further treatment that may be necessary. If the wool is removed, the usual force of jet would be too severe and cause injury, if not death. A hospital paddock should be set aside for all affected sheep; this for two reasons—firstly, to save travelling and hold them in a convenient paddock; and, secondly, once a sheep is struck it is more subject to further attack and is best kept out of the healthy flock.

The Committee of Investigation under the Council for Scientific and Industrial Research, who conducted the experiments at Dalmally, concluded that jetting with a solution consisting of 7 lb. arsenic with an equal quantity of carbonate of soda (washing soda) boiled in a small quantity of water until throroughly dissolved and then made up to 100 gallons of mixture gave 90 per cent. protection for three months.

The weather at and after jetting is an important factor, but it is regarded that the quantity of arsenic in the wool of the breach is the ingredient giving protection. Many dip mixtures are on the market, those containing arsenic being the most effective in protecting sheep.

The pressure necessary varies according to the length of wool from 160 lb. per square inch for sheep carrying eight months' wool to 60 lb. per square inch for crutched or shorn sheep. Jetting in an ordinary race is not so satisfactory as where the sheep are in a raised race. The upward tendency when applying the jet is a decided advantage besides which the surplus mixture which falls from the wool may be recovered. This, on analysis, loses very little strength. Where small numbers are to be treated a hand-pressure pump will be sufficient, but in dealing with large numbers a power plant is more suitable, many well-known makes being on the market. Recently I inspected a new type in operation which seemed to possess the necessary power in a small, simple, compact, light handling outfit made by Marine Engines (Queensland) Limited, which should prove a happy medium between the hand and heavy power outfits now in use.

When investigating the blowfly trouble in the Central West the weight of evidence was in favour of jetting.

PLATE 24.—A SERVICEABLE JETTING PLANT.

A small, simple, compact, light-handling outfit which can be carried conveniently on the running board of a car. Its base area is 3 feet by 8½ inches and height about 13 inches. Its price complete is just under £50.

PLATE 25.—JETTING RACE, BARATRIA STATION.
Note hand raised to pull cord in closing swing gate. Total length of race 50 ft., width 16 in., height to 3 ft. 6 in.

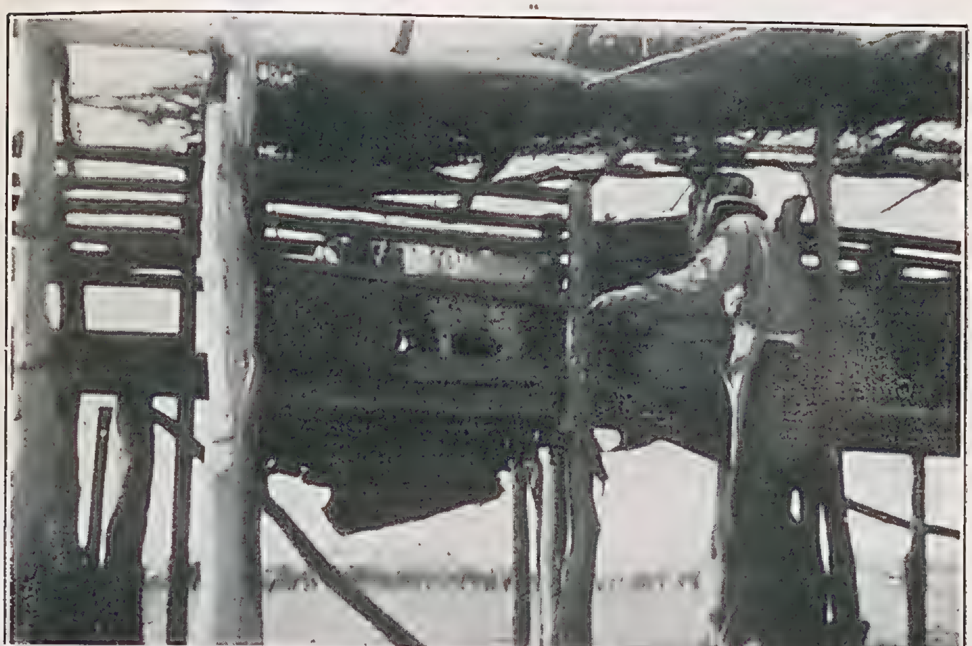


PLATE 26.—JETTING SHEEP AT BARATRIA STATION, 1929.
Note hand on lever to open sliding gate.

The Operation in Practice—A Serviceable Race.

Mr. Barton, Baratria Station, states that provided the jetting mixture is correct and properly applied, he has every confidence in its being the best means in protecting large flocks of sheep. On Baratria Station there are three elevated races which are the cheapest, simplest, and most economically worked that I have seen in use, and quite as efficient as any other style for thorough application. It is 50 feet in length and 3 feet 6 inches above ground level at the highest point just ahead of where the sheep is jetted. It is fitted with two sliding and one swing gate. This swing gate forms part of the side of the race. When the sheep passes this swinging gate the sliding gate is pushed across the race to hold it while being jetted. When the sheep is jetted the jet operator opens the sliding gate with his left hand by means of a long lever and at the same time opens the swing gate. The jetted sheep, seeing the opening in the race and also the jetted sheep in the yard, moves away and is followed by the next sheep, the sliding gate being pushed back to keep it in position while the swing gate is drawn back across the race by means of a rope by the man whose duty it is to keep the sheep up to the operator. This swing gate holds the next sheep back, and at the same time gives the opening in the side of the race to the operator to work the nozzle, which should be a straight jet.

The race is 16 inches wide inside measurement and is floored with battens 3 inches by $1\frac{1}{2}$ inches spaced $\frac{3}{4}$ of an inch apart. The uprights in use were 3 by 2 inches hardwood, as were also the sleepers to carry the cross pieces in the race. The race is 14 feet in length, starting at the forcing yard at 6 feet, narrowing down to the race 16 inches wide. Bush timber for uprights would be suitable, as also for sleepers to carry the cross pieces in the race. These latter, as well as the cross pieces in the ramp, could also be split bush timber. While present, Mr. Barton jetted 100 sheep in twenty-five minutes, having four men keeping the sheep up to him.

This jetting race has since been improved by reducing its length and fitting the jetting side with sacks fitted to run on two wires which are moved in two sections when working back along the race, the jetting being done between the two sections.

If jetted sheep are blown the poison in the wool controls the growth and spread of the maggot.

Dipping.

This is another means by which both maggots and flies may be controlled and the sheep protected for several weeks.

The strength of the mixture should be at the rate of 2 lb. arsenic to 2 lb. carbonate of soda per 100 gallons of water when the wool is up to four months' growth. When the wool is longer the strength can be reduced to $1\frac{1}{2}$ lb. at nine months' growth, but the longer the sheep must stay immersed.

Sheep should not be dipped immediately after shearing, but allowed about two weeks for the skin to recover and the cuts to heal. The sheep should not be thirsty or over-heated at the time of dipping. See that they are well drained before being put on the pasture, as the drips falling on the grass may be eaten by those following, which, if in sufficient quantity, would poison them. Fine weather should be selected and all sheep dipped as early as possible in order that they may become fairly dry before night.

Crutching also is an advantage, and to a great extent assists in protecting the sheep, as 90 per cent. are likely to be struck about the crutch. In picking out and crutching the sheep already struck, more harm than good is likely to be done, as mustering clean sheep and bringing them in contact with those that are blown usually causes a further spread of the trouble.

In crutching there is no attempt to deal with the fly, and it often happens that a few weeks after crutching 20 per cent. of the flock will be suffering from a fresh attack. As the maggots develop they do not find sufficient covering in the crutched part, with the result that they spread to the long wool. Their presence in the body wool soon induces flies to move to that part, where further trouble is generated.

If crutching is practised midway between shearings good must result, especially where ewes are treated, as by the time shearing comes on there is a sufficient length of wool to be properly shorn, but if the wool is short it is often missed, with the result that many sheep are turned out prone to a fresh attack at no distant date.

PASSION FRUIT CULTURE.

Issued by the FRUIT BRANCH, Department of Agriculture and Stock.

THE Passiflora family is of wide distribution throughout coastal Queensland, indigenous varieties being found from the South to the far North. None of these, however, produce fruit which could be classed as edible. Passiflora and Tacsonias were originally listed separately, but are now included under the former heading. Thirty-six species which have edible fruits are enumerated by Mr. P. J. Wester in the February (1931) issue of the "American Chamber of Commerce Journal," who remarks: "Here lies a tremendous virgin field open to the plant-breeder to effect new flavour combinations, enlarge the fruits, reduce the seediness, improve shipping qualities, and extend the cultivatable range of the passion fruits." Two varieties, *Passiflora amethystina* and *P. laurifolia* (both producing hard-shelled fruit of most excellent quality, though the latter in sparse quantity on account of it being more tropical) existed in Southern Queensland some forty years ago, and appear to have been almost forgotten. Both of these varieties, particularly the latter, are considered to be almost or entirely immune to the disease known as "leaf spot" which causes such heavy losses with the common variety, *P. edulis.*

All passion fruits are climbers, and the varieties above referred to are either semi-tropical or tropical, and require a well-drained, friable, rich sandy loam soil to be grown to the best advantage; but the common passion fruit can be grown on comparatively poor soils that are naturally well drained, provided they are systematically manured, well cultivated, and are not subject to severe frosts. Stagnant water at the roots is fatal, and very heavy soils should not be selected.

As with all other fruits the land should be thoroughly prepared prior to planting, so as to reduce it to a state of perfect tilth, and provide the right soil conditions in which to start the young plants. This is a matter of very great importance, and one that does not receive the attention it should, as not only passion fruit but all other fruits are frequently planted in land that is very far from being in good order, and which should have received much more care and attention in order to enable it to produce healthy vigorous plants that will yield payable returns.

Passiflora edulis—Passion Fruit.

This variety is the one that is most commonly grown, not only in Queensland, but throughout Australia. There are at least three types, the large fruited or "giant" passion fruit, sometimes called "Mexican," which attains a size of over 2 inches in diameter, the common type which averages about 1¾ inches in diameter, also a yellow-coloured variety. The former, though a larger and more showy fruit, is somewhat disappointing, as it is frequently a shy bearer and the fruit does not contain as large a percentage of pulp as the common type, which is the best all-round commercial fruit. The best fruit has a very dark purple skin, which is filled with an orange-coloured pulp in which the seeds are imbedded. The pulp is slightly sub-acid and possesses a very distinctive agreeable flavour, so that when used as an ingredient of a fruit salad it imparts its characteristic flavour to it, and the salad is greatly improved thereby.

The plant is easily propagated from seed, all that is necessary being to select perfect fruit, fully matured, from a perfectly healthy plant that is free from leaf, root, vine, or fruit affection of any kind. The pulp, when removed from the fruit, should be placed in a tub or suitable vessel, and be covered with water, the mass being then allowed to ferment long enough to free the seeds from the pulp, when they should be strained off, well washed, and dried. Prior to planting, the seed should be soaked overnight by placing it in the bottom of a basin and pouring hot water, at a temperature of 180 deg., over it, and allowing it to remain until the following morning. If early spring-ripened fruit is selected and the seed is planted as soon as ready, good strong plants will be available for summer planting, but, if plants are wanted for early spring planting, the seed must be sown the previous autumn. The seed should be sown in a specially prepared seed-bed in soil of a light, free nature, containing a quantity of leaf mould or humus—a good potting soil—and the young plants should be sheltered from the sun and judiciously watered should the soil become dry. When the seedlings are about 1 foot high or larger they should be planted out in the permanent position, taking care to keep them moist so that they will not dry out.

Prior to planting, the land is marked off in rows not less than 10 feet apart. A trellis consisting of good fencing posts, placed 15 feet apart in the row, is erected along the row, the posts being set with their width across, not in the

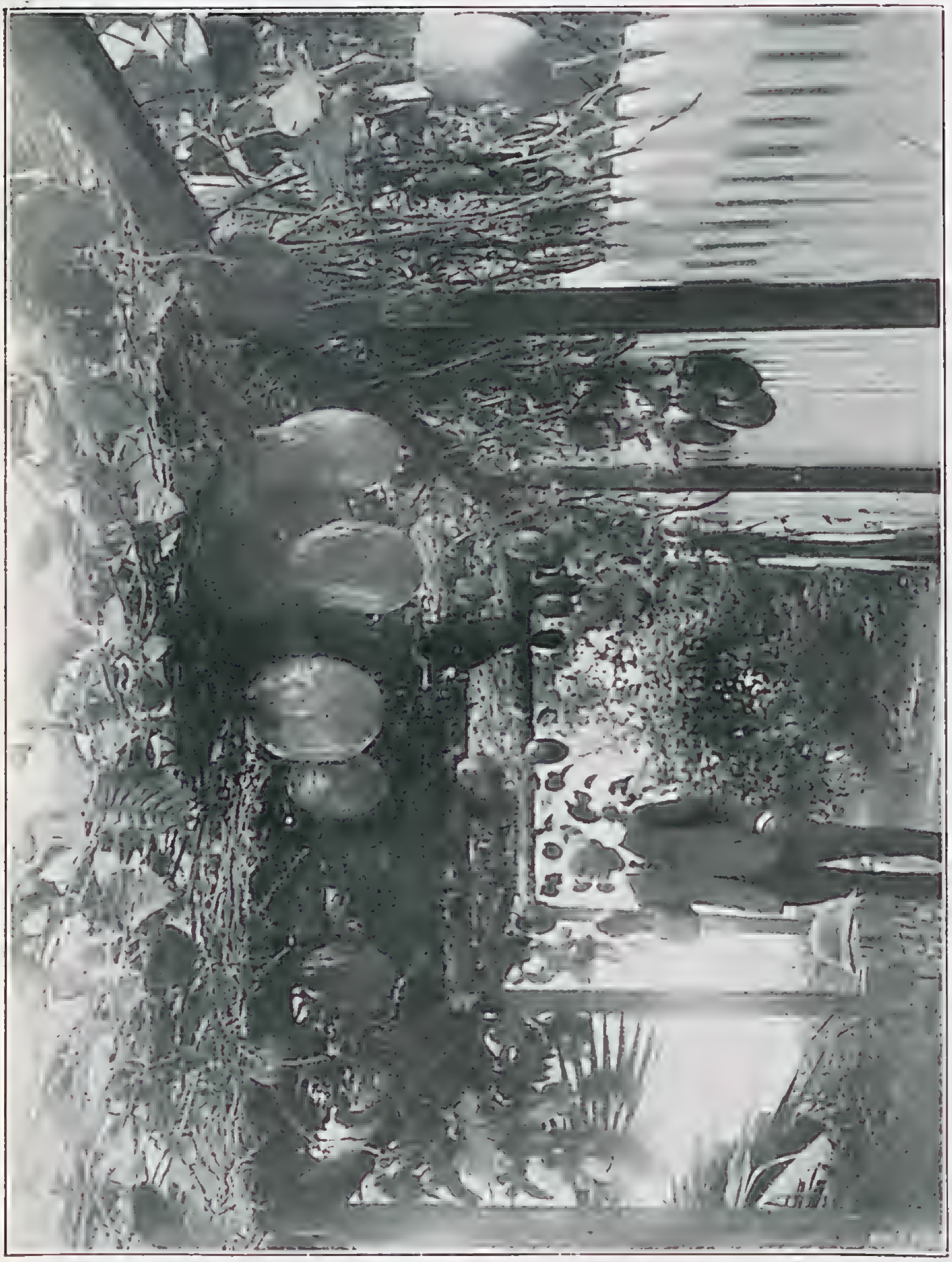


PLATE 27.—THE LARGE-FRUITED GRANADILLA.

Carrying specimens 9 in. x 17 in. circumference, grown by Mr. J. C. Brünnich, in his garden at Stanley Terrace, Taringa, near Brisbane.

direction of the row. The posts should be about 8 inches wide by 3 inches thick by 6 feet 6 inches long, and be set 20 inches in the ground. The end posts must be much heavier, sunk much deeper in the soil, and well strutted as they have to act as strainers, and prevent the wires that are attached to the top of the posts from sagging when they have to carry a heavy growth of vines. Two No. 8 galvanised wires are firmly fixed to the top of the posts, one on each side, so that when in position they form two parallel lines, 8 inches apart, on which the vines are trained. The young plants are planted midway between the posts, right under the wires, and are tied to a light stick or other temporary support till they reach the height of the wires, when they are topped and two main lateral stems are allowed to develop, all other lateral growths on the main stem from the ground to the wire being removed. The two main laterals are then trained on to the wires, and when they meet those of the adjacent plants their growth is stopped by pinching back the terminal growth, which causes secondary laterals on which fruit is borne to be thrown out all along the main lateral. These secondary laterals, if left alone, throw out further laterals and these again in turn make more lateral growth, with the result that a very dense and tangled growth of vines is produced from which it is hard to separate the primary and secondary laterals and which, owing to its dense habit of growth, is frequently prone to be attacked by disease. Systematic pruning is, therefore, desirable—first to keep the plants healthy, secondly to produce strong new lateral growth on which good fruit will be grown, and thirdly to bring in the crop at different periods of the year, so as to get a better distribution of the crop instead of a glut at one time and a scarcity at another. When an autumn or winter crop is desired the main summer crop must be sacrificed. This is done by pruning the vines right back to the secondary laterals when they are showing their blossoms for the summer crop, and this will have the effect of throwing out a new growth which will blossom at a later period. A word of warning is, however, necessary; don't prune hard back in dry weather—you will probably kill the plants if you do so—but wait till the ground has had a good soaking, when the plants will throw out a fresh growth very quickly and will not be permanently injured. A good dressing of quick-acting manure at this time will be found beneficial and materially increase the following crop.

Mr. Brünnich, in the publication ''Complete Fertilisers for Farm and Orchards, recommends the following manure for passion fruit:—

> ''Use per acre, in accordance with the richness of the soil, a mixture of—1 to 2 cwt. nitrate of soda; 4 to 8 cwt. blood and bone manure; 1 to 2 cwt. superphosphate; 1 to 2 cwt. sulphate of potash. A top-dressing of 1 cwt. of nitrate of soda in spring will be found beneficial.''

This is a complete manure rich in organic and inorganic nitrogen, citrate and water soluble phosphoric acid as well as potash, and should not only act quickly but be fairly lasting in its effect.

The passion fruit is liable to be attacked by several different pests and diseases, of which the leaf disease is by far the most serious. This disease has only made its presence felt during recent years, and is of an obscure nature. It attacks every part of the plant above ground—the flowers, leaves, and laterals. The latter are killed by a small portion of the stem becoming affected to such an extent that it dies and all the rest of the lateral that is beyond the part attacked shrivels and dies, frequently when it is covered with fully grown but immature fruit which shrivels up. This affection has received the careful attention of the Vegetable Pathologist, and the result being the discovery of a new fungus controllable by Bordeaux mixture. Red spiders and spinning mites frequently injure the leaves and young laterals. These pests can be kept in check by spraying with sulphide washes or dusting with finely-ground sulphur.

Scale insects of various kinds also attack the wood, leaves, and fruit, generally where plants are grown under adverse conditions. These may be kept in check by systematic spraying, but can only be effectual when the vines are systematically pruned, as when grown in a dense mass the spraying material used has little chance to come in contact with the majority of the insects.

Nematodes injure the roots, particularly in light soils, and an application of cyanogas to the soil prior to planting will temporarily eliminate the pest from treated soil. The material is best applied when ploughing by being lightly distributed along the bottom of each furrow immediately prior to its being covered. A simple attachment may be fitted to the plough to allow the cyanogas to fall immediately in front of the falling earth which is being turned by the mould board. When a small area has been treated a heavy roller should be passed over the surface to close the soil and delay the escape of the gas fumes. The addition of nitrogen to

PLATE 28.—PASSION FRUIT, REDLAND BAY, SHOWING METHOD OF TRELLISING, AND PART OF A VINE IN FRUIT.

the soil also militates against the effect of the pest. Light dressings of nitrate of soda or sulphate of ammonia at intervals of not more than three months are recommended. The quantity for each dressing (February, May, August, and November) in light soils should be at the rate of about 1 cwt. per acre. In medium and heavy soils this quantity may be reduced by one-half.

Fruit fly also attacks the fruit, as does also the sucking bug. The latter sometimes causes a heavy loss, as the punctured fruit either drops or if it remains on the vine becomes hard and woody. This bug is very fond of the red prickly cucumber, commonly known as the "Cape or African Cucumber," and if this is used as a trap, a large number of the bugs can be caught and destroyed.

When fruit fly is troublesome, trapping with Harvey's fruit fly lure as soon as the first sign of the fly's presence is seen, or with the following lure originating with Mr. H. Jarvis (Entomologist)—1 teaspoonful synthetic Vanilla, 1 tablespoonful Scrubb's ammonia, and 1¼ pints of water—and systematically attending to the traps will result in the destruction of large numbers of female flies, and thus reduce the loss they would cause were they allowed to lay their eggs in the immature fruit whilst the skin is still soft and before it becomes so hard that the fly cannot pierce it. Ordinary glass fly traps, placed not more than 30 feet apart, are recommended, and the renewal of the lure contained in these every three days is desirable.

Passiflora quadrangularis—Granadilla.

The granadilla is a tropical fruit that is better suited to the northern than to the southern part of this State, though excellent examples of the larger type of granadilla—"*Macrocarpa*"—can be produced in the coastal districts both to the south and north of Brisbane, provided the situation is a warm one, free from frost and well protected. The *macrocarpa*, as its name signifiees, is a very large type of granadilla, the fruit frequently weighing several pounds. The seed cavity is small for the size of the fruit, and is surrounded by a thick layer of whitish flesh which has no distinctive flavour, but which, when flavoured with lemon or other suitable flavouring, is used for pies. It is not as a rule a heavy bearer, and must be grown on a horizontal (not lateral) trellis.

The Northern Granadilla—*quadrangularis*—is a smaller fruit of a somewhat irregular, oblong shape, about 4 to 4½ inches in diameter. The pulp cavity is large and is filled with large seeds surrounded with a pale yellow pulp of exceptionally high flavour when the fruit is fully ripe, which is known by the outer fleshy covering becoming soft, and the skin, instead of being a pale green, turns a dull yellowish-green colour. This variety when fully ripe is one of the highest flavoured tropical fruits, and eaten either alone or used in combination with the papaw, pineapple, banana, and the juice of a lemon or lime to form a fruit salad, it is very hard to beat. Unfortunately, it does not carry well and consequently can only be obtained in perfect condition where grown. The granadilla requires a deep, well-drained, rich loamy soil to be grown to perfection, and it does best when trained to an overhead trellis (as shown in illustration herewith, which was taken recently at Taringa, near Brisbane, and gives a good idea of its habit of growth). Similar manuring to that recommended in the case of the common passion fruit will be found beneficial.

Passiflora laurifolia, "Bell Apple."

The Bell Apple is practically unknown in this State, though its fruit is quite equal to that of the previously mentioned varieties. It is a handsome and vigorous climber, and is more valuable for covering unsightly edifices or for ornamental purposes than for fruit production, and its cultivation for the latter purpose is not recommended. Without hand fertilising it carries but few fruit in the South, but would probably be much more productive in the tropics.

Passiflora ligularis, Mexican Passion Fruit.

May be eliminated from the list. The pulp is almost flavourless beyond a trace of sugar, and the appearance of the fruit is not attractive.

Passiflora mollissima, the Banana-shaped Passion Fruit.

The fruit of this variety is used as a substitute for the genuine passion fruit, which the pulp somewhat resembles, also the seeds. The latter are in excessive quantity, whilst that of the pulp is correspondingly reduced. The vine is hardy and of very free growth, but cannot be recommended for planting for commercial purposes.

CLIMATOLOGICAL TABLE—MAY, 1931.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	30.00	84	73	87	2, 4, 5	65	1	132	12
Herberton	..	75	58	82	13	41	31	154	9
Rockhampton	30.11	80	62	87	1, 5, 14	46	30	205	9
Brisbane	30.16	74	59	82	5	48	30	220	12
Darling Downs.									
Dalby	30.18	74	51	82	2,12	35	30, 31	125	6
Stanthorpe	..	67	46	75	2	31	16,19,20	361	14
Toowoomba	..	67	50	76	4	35	16	284	12
Mid-interior.									
Georgetown	30.00	90	66	95	12	47	29	Nil	..
Longreach	30.08	81	55	92	13	36	29	74	5
Mitchell	30.14	74	50	86	13	34	30	184	4
Western.									
Burketown	30.01	87	66	92	14, 19	51	30	4	1
Boulia	30.07	82	56	99	6, 13	39	28	77	4
Thargomindah	30.13	70	54	88	6	41	29, 31	281	10

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MAY, 1931, AND 1930 FOR COMPARISON.

Divisions and Stations.	Average Rainfall. May.	No. of Years' Records.	Total Rainfall. May, 1931.	May, 1930.
North Coast.	In.		In.	In.
Atherton	1·95	30	2·05	3·77
Cairns	4·35	49	4·04	6·07
Cardwell	3·50	59	4·34	6·52
Cooktown	2·87	55	1·56	4·52
Herberton	1·59	44	1·54	2·48
Ingham	3·36	39	3·99	7·85
Innisfail	12·26	50	7·10	22·91
Mossman Mill	3·50	18	2·29	6·49
Townsville	1·31	60	0·49	4·48
Central Coast.				
Ayr	1·10	44	1·31	3·00
Bowen	1·32	60	0·80	5·73
Charters Towers	0·80	49	0·09	3·75
Mackay	3·74	60	2·56	7·92
Proserpine	4·28	28	2·84	5·87
St. Lawrence	1·78	60	0·67	5·96
South Coast.				
Biggenden	1·72	32	2·04	2·34
Bundaberg	2·63	48	4·39	3·37
Brisbane	2·82	80	2·20	7·98
Caboolture	2·90	44	3·44	8·38
Childers	2·13	36	3·20	3·16
Crohamhurst	5·02	38	2·32	15·58
Esk	2·01	44	1·36	5·27
Gayndah	1·57	60	1·93	5·90
Gympie	2·88	61	3·12	4·42
Kilkivan	1·84	52	2·29	4·14
Maryborough	3·09	59	2·46	5·66

Divisions and Stations.	Average Rainfall. May.	No. of Years' Records.	Total Rainfall. May, 1931.	May, 1930.
South Coast—continued:	In.		In.	In.
Nambour	4·81	35	4·52	8·87
Nanango	1·51	49	2·66	3·47
Rockhampton	1·48	44	2·05	4·78
Woodford	2·96	44	2·53	9·04
Darling Downs.				
Dalby	1·30	61	1·25	2·21
Emu Vale	1·13	35	3·46	2·39
Jimbour	1·20	43	1·19	2·21
Miles	1·50	46	1·35	3·22
Stanthorpe	1·85	58	3·61	2·84
Toowoomba	2·19	59	2·84	5·50
Warwick	1·54	66	3·48	2·86
Maranoa.				
Roma	1·42	57	1·37	1·97
State Farms, &c.				
Bungeworgorai	0·83	17	1·42	2·00
Gatton College	1·52	36	1·07	3·25
Gindie	0·95	32	0	3·76
Hermitage	1·17	25	3·56	2·52
Kairi	1·84	17	1.23	4·50
Mackay Sugar Experiment Station	3·29	34	1·66	7·88

GEORGE G. BOND, Divisional Meteorologist.

PACKING HOUSES AND THEIR EQUIPMENT.

By JAS. H. GREGORY, Instructor in Fruit Packing.

PACKING SHEDS.

THE fruitgrowing areas in some districts of Queensland being widely scattered makes it in some cases impossible for central packing sheds to be established, so it is felt that a few words on packing houses and their layout, with accessories used, would be of assistance to many growers desiring to erect their own packing sheds. The writer, whilst visiting growers, has often noticed the inefficient method of handling a fruit crop, no effort being made to decrease the time required for casemaking, packing, and despatching, by the use of packing-shed accessories. Growers, when asked why they do not have this or that, complain of the cost, forgetting that the increased speed and easier handling will soon save the cost of packing and casemaking benches, conveyors, &c., at the same time making the work easier and more pleasurable. In this article a description of how to make some of the accessories and their approximate cost is given. As far as sizing machines are concerned no designs of home-made articles are given, as growers have a wide choice of commercially manufactured machines which are reasonably cheap, whilst many have their own home-made product which can easily be adapted to the layout of a packing shed.

Packing Shed Layout.

In dealing with packing sheds it is essential to study economy of working. This is attained by having the work going or flowing in one direction through the shed, so that the packers and floorman nailing down and despatching do not get in each others way; receiving and having fruit stacked in places to permit as short a distance possible of carriage to sizing machines or packing bins; gravity conveyors to carry cased fruit to lidding press or trucks. A study of the two packing-shed layouts submitted will help to show how the work is conducted to obtain these results.

The design of the large shed (Fig. 1) is suitable for the handling of an output of 2,000 to 3,000 cases per week if fruit can be loaded daily on rail. The cost of the plant would be approximately—

	£	s.	d.
Sizer and elevator conveyor	120	0	0
Gravity conveyors	35	0	0*
Engine	30	0	0
Casemakers' bench	1	0	0
Packing benches	12	0	0
Labelling table	1	0	0
Office fittings	5	0	0
Nailing-down press	15	15	0
Total	219	15	0

This plant is suitable for small co-operative companies and central district packing houses. The cost of the building would be in the vicinity of £450 if built of galvanized iron.

The smaller shed illustrated (Fig. 2) is very suitable for the average grower, allowing easy handling of 250 cases a day. If the grower has not the capital to expend in gravity conveyors and nailing-down press (approximate cost, £25) a good nailing-down stand is made by laying two pieces of 3 by 2 or other suitable timber on the floor for nailing down upon. These battens permit the bottom of the cases to bulge when the lid is placed in position and nailed. As will be seen by examining the diagram the same principle of continuity from the reception of the fruit to its despatch is followed as in the larger shed. Cost of plant (approximate):—

	£	s.	d.
Sizing machine	35	0	0
Packing benches	4	0	0
Casemakers' bench	1	0	0
Total	40	0	0

It will be seen the plant required in the packing shed is confined to casemaking bench, packing stands, sizer, and accessories for casemaking and packing. A description of how to make these will help the home carpenter.

* (30-ft. conveyor and two 90-deg. curves.)

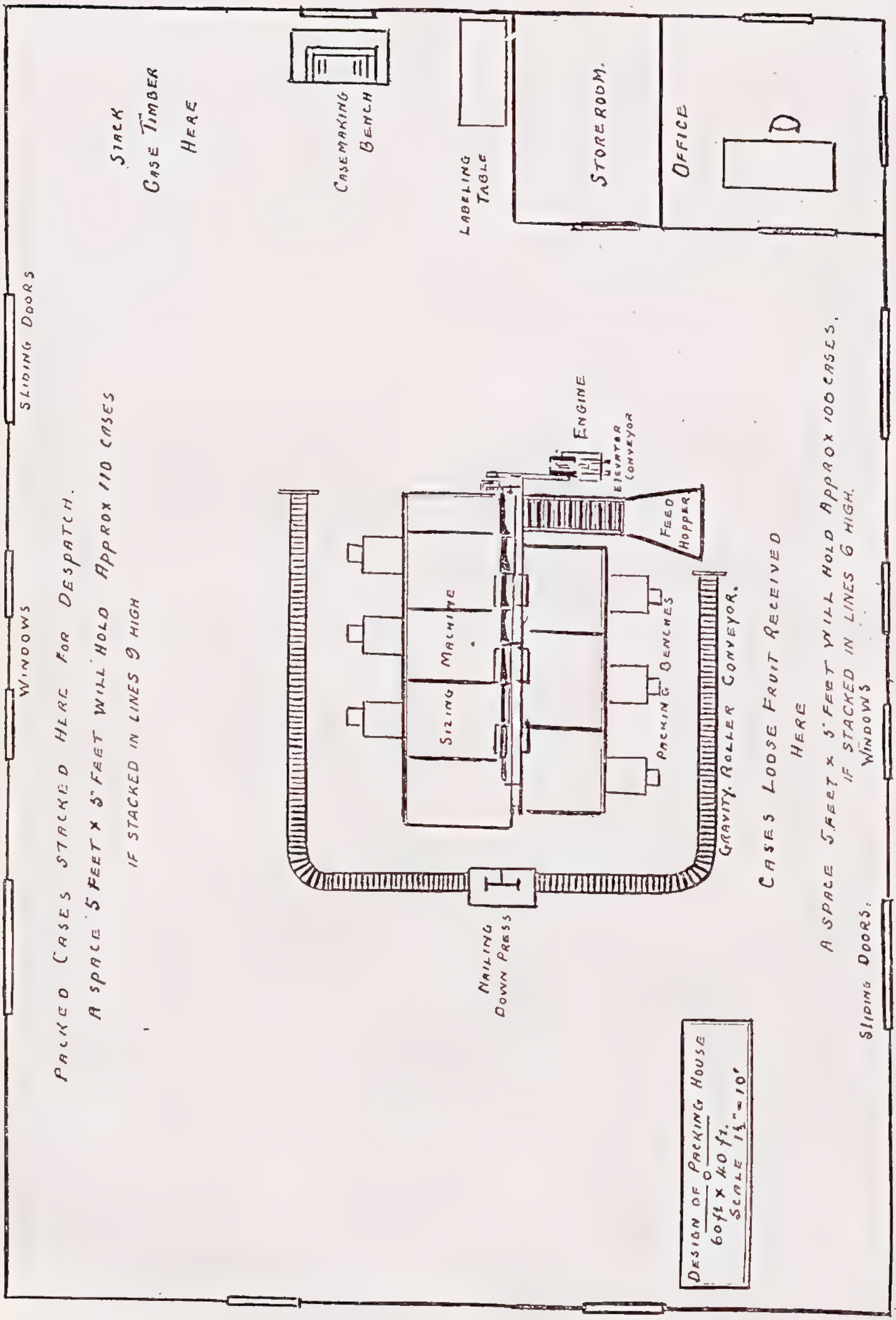


Plate 29 (Fig. 1).

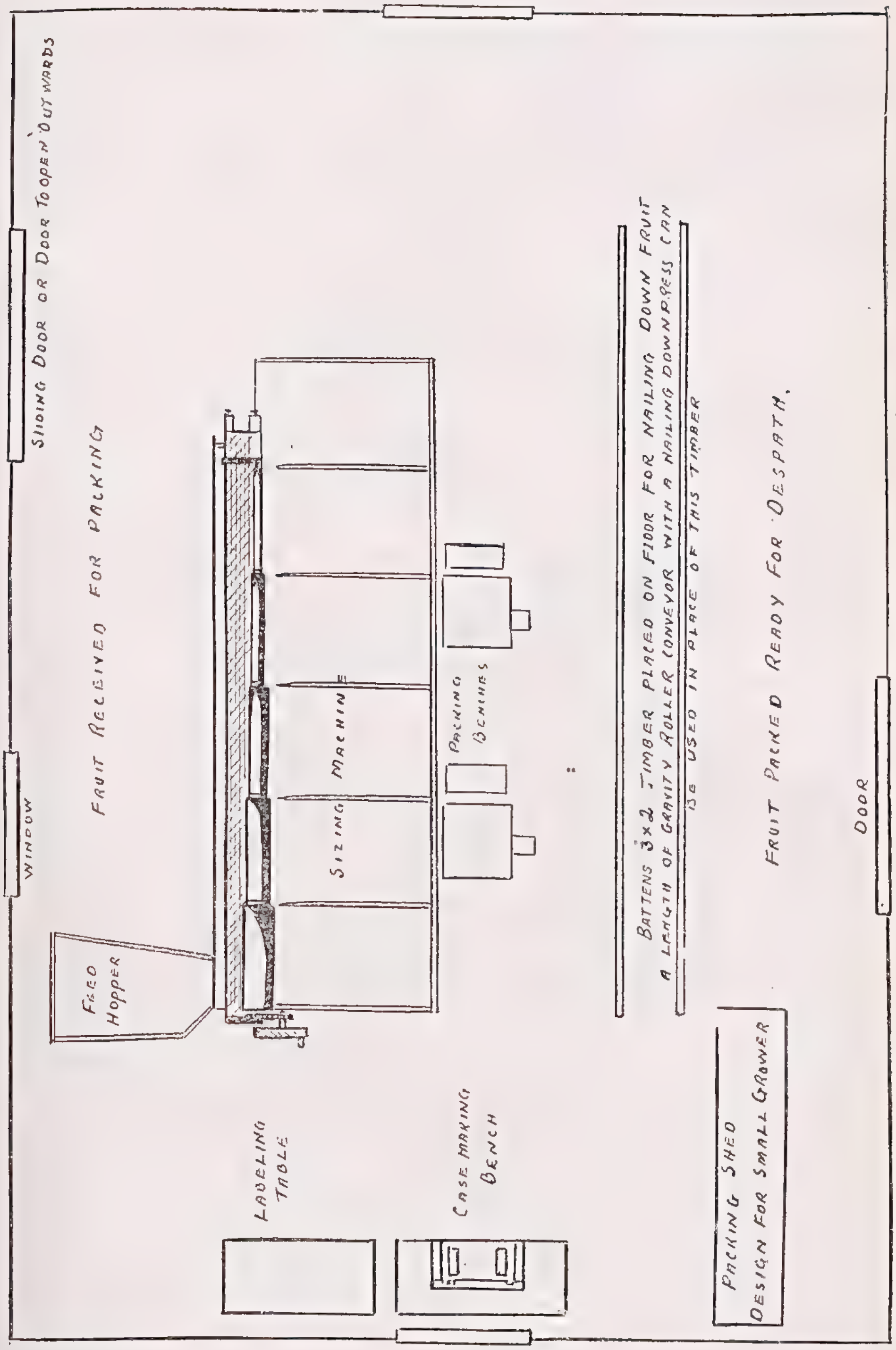


PLATE 30 (Fig. 2).

Casemaking Bench.

The cost of timber is approximately £1, and the price will be repaid many times during a season by the increased output and with the advantage of a better-made box. The illustration (Fig. 3) shows the complete bench made to take cases without a partition, whilst (Fig. 4) is the top of the bench which would replace the top of (Fig. 3) if the bench was to be used for making cases with a partition. Cases are always measured by the internal dimensions, so it is necessary to always take care that the inside length of the case corresponds to the distance between the notches in the back stop (A) (Figs. 3 and 4). Some growers use a tree stump for a bench. This is quite a good base for a bench and will do excellent work by adding just the bench stops to the top of the stump. When placing the legs on the bench it is necessary to attach them as nearly as possible under the slots that hold the case ends. This gives a solid base for nailing.

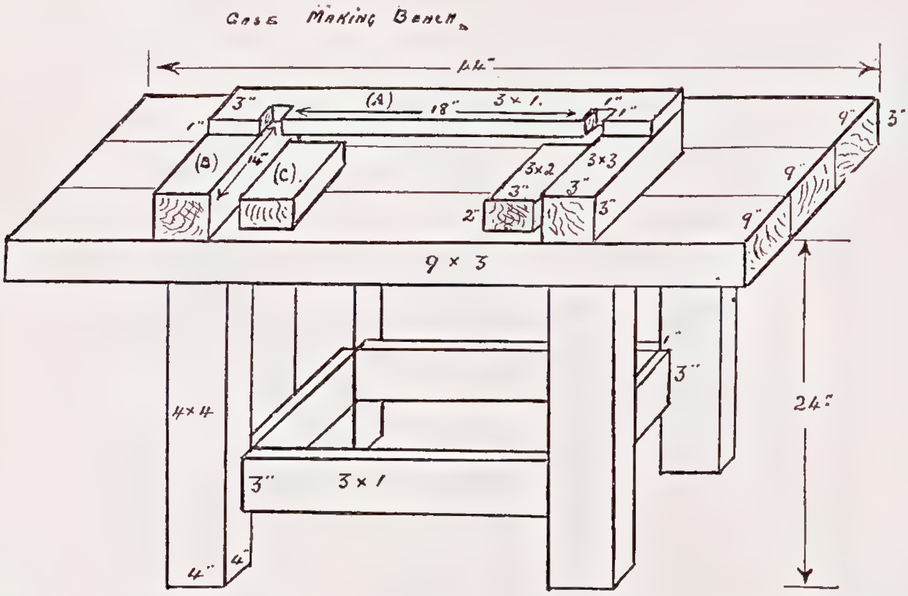


PLATE 31 (Fig. 3).—CASEMAKING BENCH FOR MAKING AUSTRALIAN DUMP, CANADIAN STANDARD, BUSHEL AND HALF-BUSHEL CASES, AND OTHER FRUIT CASES, 18 INCHES IN LENGTH, INSIDE DIMENSIONS.

Specifications.

Length	44 inches	Timber.—Legs		4″ x 4″
Height	24 inches from floor	Stops—Outside		3″ x 3″ (B)
Width	27 inches		Inside	3″ x 2″ (C)
			Back	3″ x 1″ (A)
		Top		9″ x 3″
		Stays		3″ x 1″

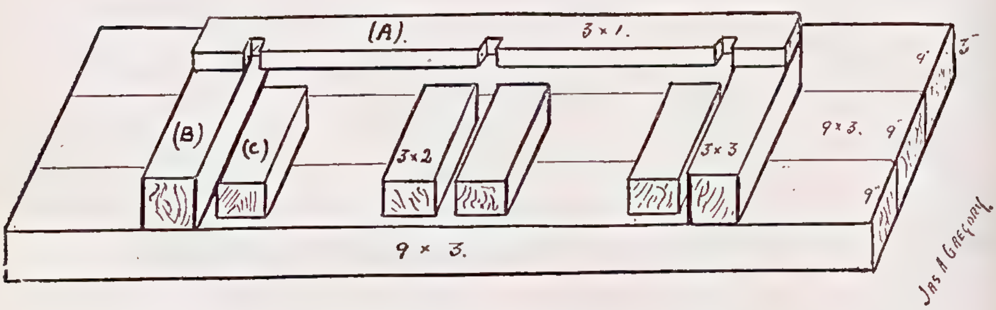


PLATE 32 (Fig. 4).—CASEMAKING BENCH FOR LONG BUSHEL CASES OR OTHER CASES WITH A PARTITION.

Case Makers' Nail Comb.

As a help to casemakers a nail comb (Fig. 5) for picking nails up with the heads in one direction will be found useful. The comb is made of a heavy piece of galvanized iron turned to clip on to the end of the nail box with a number of knitting needles soldered to the iron. The knitting needles are placed so that nails will slide between them easily, without dropping through, and remaining suspended by their heads in the comb. A comb containing sixteen needles is a handy size for working, and will hold enough to make ten to fifteen cases. The needles are best placed with the ends shaped in a circular manner, the centre needles projecting about 6 inches and the side needles 5 inches. The comb is used by scraping or pushing it through the top of a box of nails. The cost of the comb is the price of four sets of knitting needles, and the necessary solder (approximate cost 2s. 6d. in most country districts).

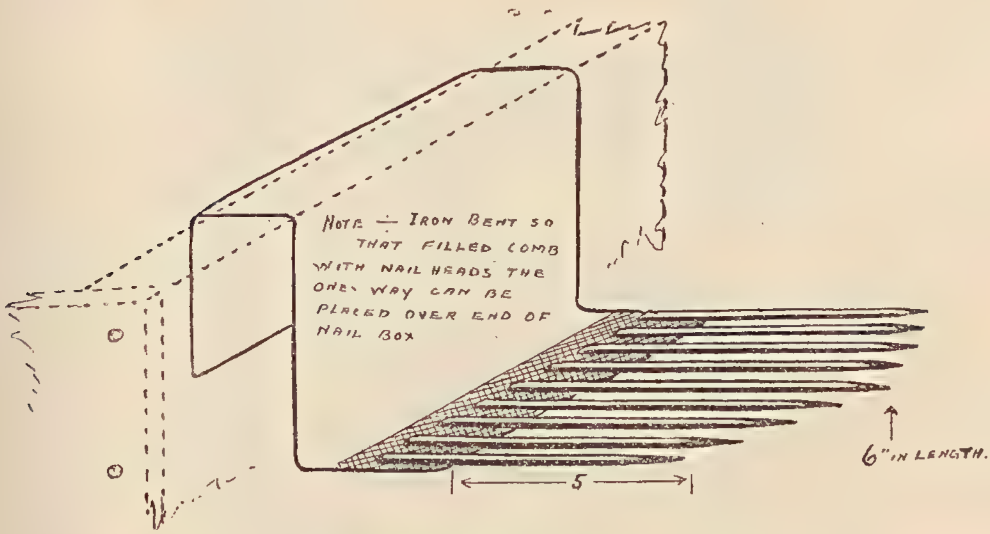


PLATE 33 (Fig. 5).—CASEMAKER'S COMB.
Made of Galvanised Iron and Knitting Needles.

Fruit Packing Bench.

Packing is a tiring work and a job that cannot be done properly, as some packers think, by sitting down. Many growers make no effort to make packing easy, and often condemn packing fruit such as tomatoes as too hard, simply because they endeavour to pack with their case level and have difficulty in getting the fruit to remain in place. This difficulty can be overcome by building the packing stand illustrated in Fig. 6 with one end of the case higher than the other. With this stand packing is done from one end of the case and not from the side. This allows the tilt on the case to keep the fruit in position without the packer having to hold it in with one hand as when packing from the side, thus leaving both of the packer's hands free for working. The packing stand illustrated is for use when wrapping fruit, but with fruit such as tomatoes, passion fruit, or other unwrapped fruit it is not necessary to attach the tray for holding the wrapping paper. The paper-holder is best made to take the largest sized paper used in wrapping citrus and deciduous fruits. If made 4 inches deep at the back and 2 inches deep in front, with the front cut out in the centre as illustrated, a large quantity of paper can be held in the holder. The paper-holder should be placed at the height most suitable for the comfort of the packer. The packing needle illustrated in Fig. 7 is a useful addition to the packing bench, with paper-holder.

Spring Board for the Comfort of the Packer.

Illustrated with the packing stand is an easily made accessory to ensure comfort and ease for a long day's packing. Standing on a hard cement or wooden floor all day whilst packing is very hard on most packers, particularly female operatives. Nearing the end of the day a packer's output for the last couple of hours is often

curtailed through aching legs and back. This can be largely overcome if not entirely eliminated by the use of a spring board to stand upon (Fig. 6). Made from timber surrounding bales of wrapping paper the cost is nil, but the expenditure of a few pence on 6 feet of 6 by ½ inch timber for the top and 3 feet of 2 by 2 inch for the two battens at the ends will soon be repaid by the extra comfort and efficiency given. The cost of the packing stand and spring board should not exceed 40s. complete.

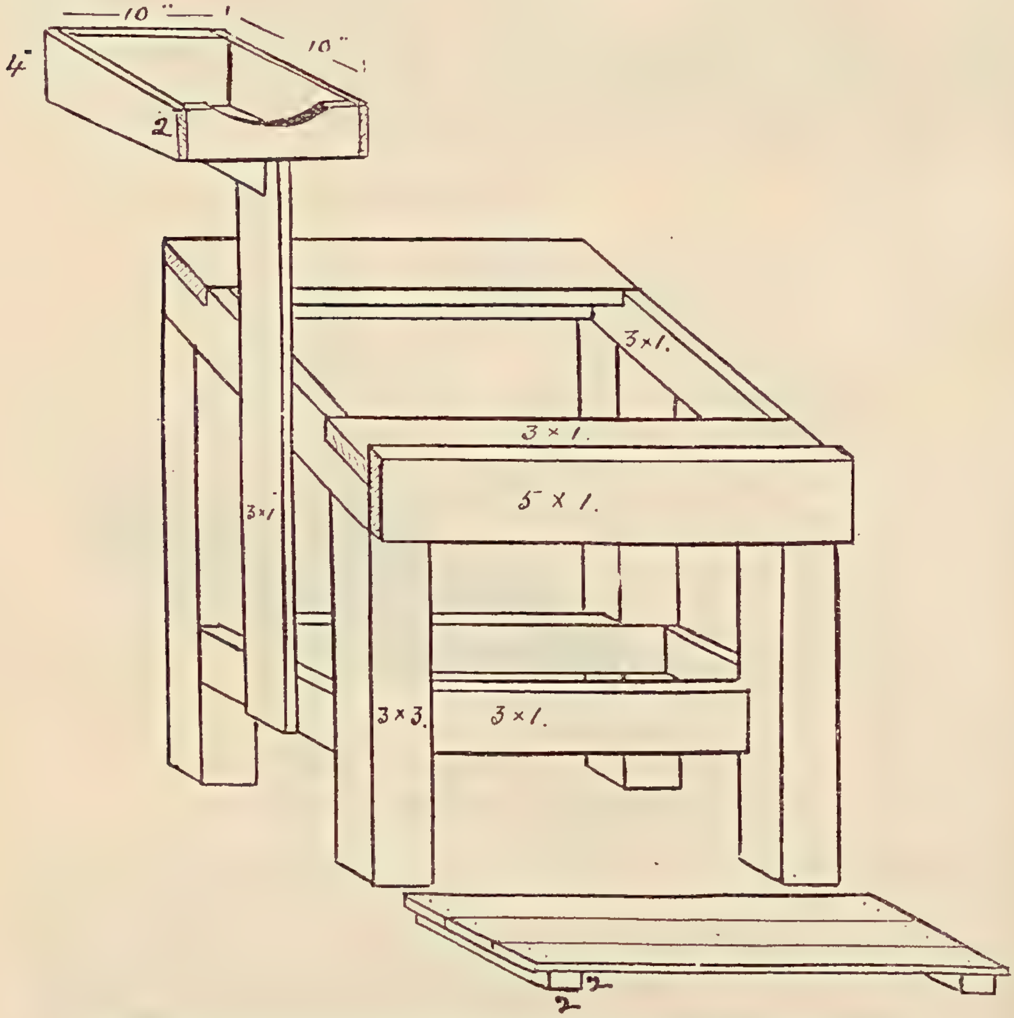


PLATE 34 (Fig. 6).—FRUIT PACKING BENCH AND SPRING BOARD.

Specifications.

Height in front	22″
Height at back	27″
Depth from front to back	18″
Size of Paper Tray ..	10″ x 10″ Inside Dimentions
Legs	3″ x 3″
Stays	3″ x 1″
Front board	5′ x 1″

Wrapping Paper Needle Holder.

This is a useful accessory, and when used in conjunction with the wrapping-paper holder will be found to be a good insurance against paper wastage through wind, &c. Simple to make out of a small sheet of heavy galvanized iron, copper, or brass cut and bent to the required shape to allow the needle to slide up and down through it. The needle is made of a 15-inch length of a heavy gauge galvanized or fencing wire, turned over 4 inches from one end and pointed to make the needle. The turn should be made to allow about 1 inch between the needle and the sliding portion

holding the weight. The sliding portion should be filed square to enable it to slide through the supporting plate. A phonograph needle fitted in the end of the needle portion is an improvement on just pointing the wire. The needle can be fitted by drilling and soldering or by putting a thread on the end with a set nut. The weight is made of lead, and needs to be about 6 ounces in weight. The cost of this accessory is practically only that of the labour.

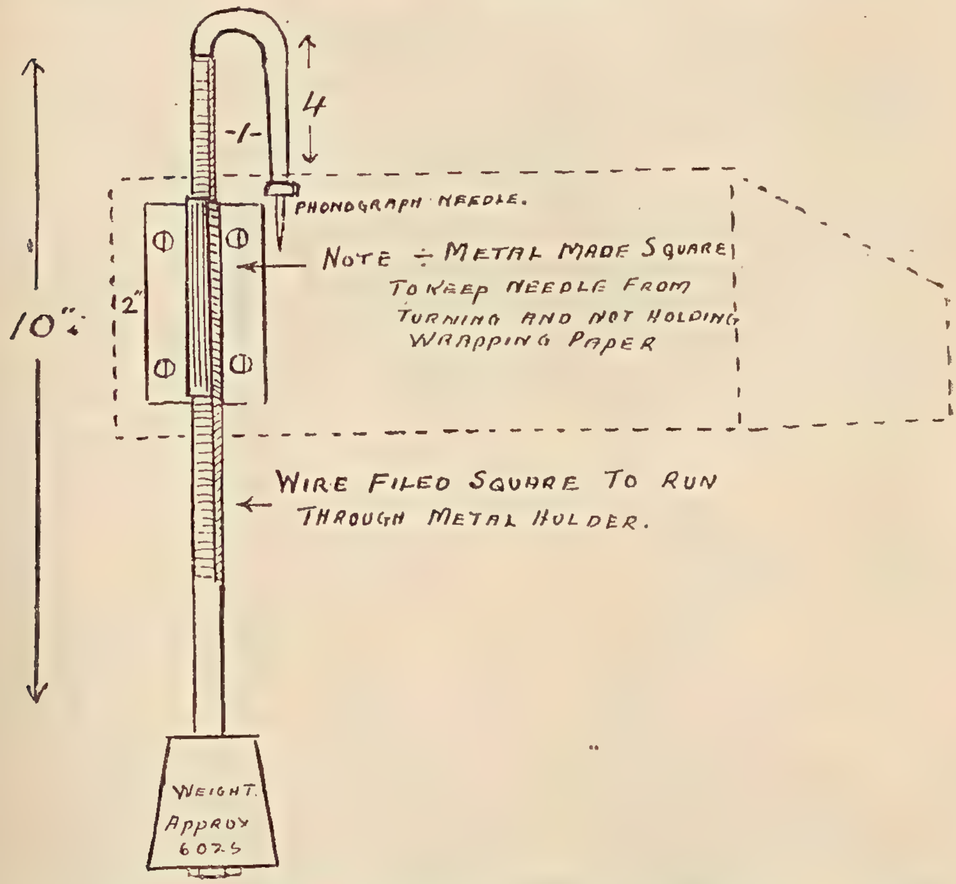
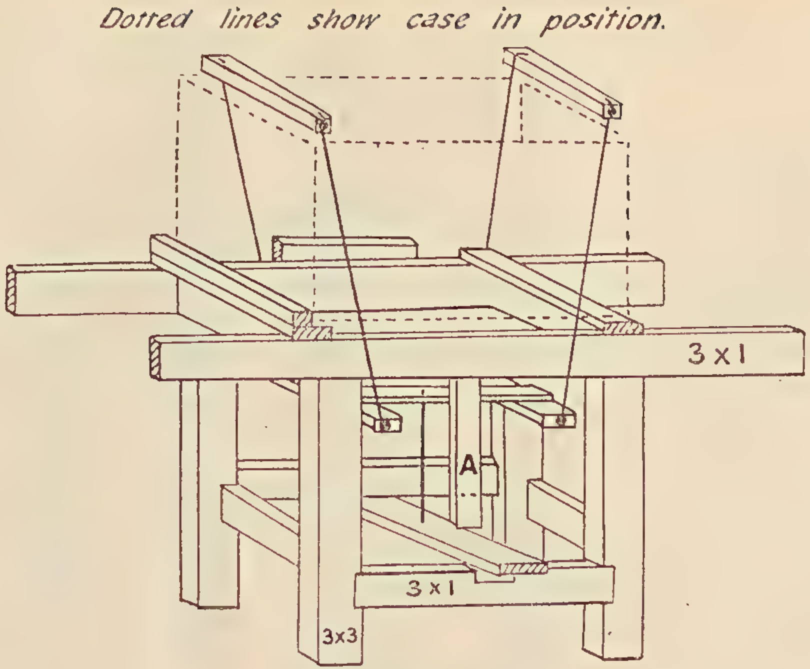


PLATE 35 (Fig. 7).—PACKER'S NEEDLE TO HOLD WRAPPING PAPER IN POSITION.
The paper holder is represented by dotted lines. The weight should be about 6 ounces.

Case End Scraper.

A cheap and efficient case-end scraper for removing dirt or stencil ink smudges can be made out of an old file shaped and sharpened (Fig. 8). Any blacksmith will make this tool for a few pence, and it will be most useful in the packing house.

PLATE 36 (Fig. 8).—CASE END SCRAPER.
Made from an old File or Rasp.

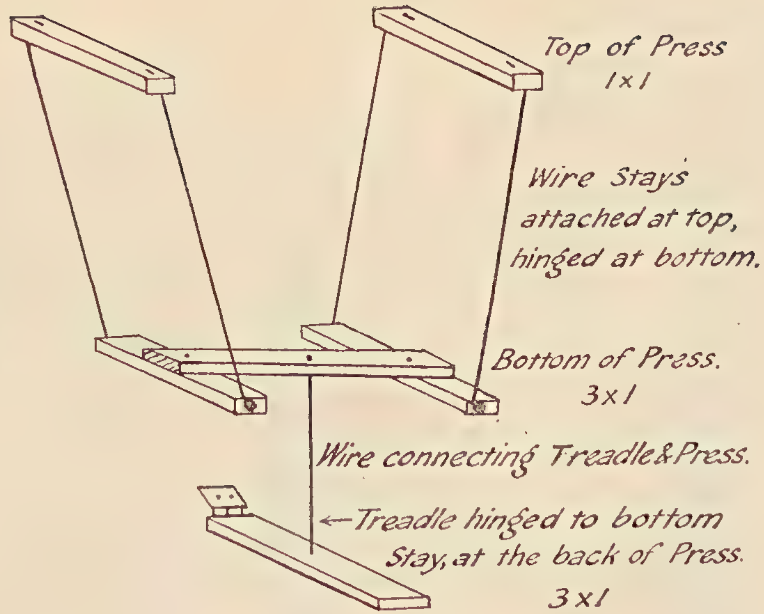


CASE LIDDING PRESS.

Specifications.

Length ..	4 feet
Width ..	12½ inches
Height ..	2 feet
Timber—Legs	3″ x 3″
Frame	3″ x 1″

(A) This is a board hinged to the top rest, bearing on the treadle and holding down the lid whilst nailing, thus making it unnecessary to keep pressure on the treadle with the foot.



PRESS WITH FRAMEWORK REMOVED.

Length of wires 19 inches for standard case.
Length of bottom wire 12 inches.

PLATE 37 (Fig. 9).

Fruit Case Lidding Press.

No packing shed should be without this accessory. Whilst there are many excellent presses on the market, some growers may prefer to make their own. The cost of the timber and materials for the press is about 10s. The materials necessary are 8 feet of 3 by 3 for the legs, 28 feet of 3 by 1, two bolts 3 inches long, and four 1½-inch screws with washers to match. Two-inch nails will be found long enough. The short lengths of wire required for the press vary in length according to the case used, and require to be made of heavy-gauge wire. The short lengths of 2 by 1 and 1 by 1 timber required for the stops and press (see Fig. 9) can be cut from a piece of 3 by 1 ripped down. It is necessary to allow about 4 inches clearance of the top of the press above the case to allow for variations of the height of the fruit in the case, and the amount of bulge required on the lid when nailing down. A close examination of the illustrations will show how to build the press. The wires are attached to the pressing stays by drilling the wood with two holes about 1 inch apart and bending the wire to fit. Care should be taken to see that the end of the wire does not project through and damage the lids when pressing. The bottom end of the wire is attached to the stays by the 1½-inch screws and washers, an eye being formed by carefully bending the wire to fit around the screws. It is necessary to have the wire hinged in this way to enable the pressure stays to be brought easily over the lid of the case. The ends of the two pieces of wood placed across the frame, on which to stand each end of the case when attaching the lid, should be allowed to project on either side and be shaped to stop the wires from falling flat over either end of the frame. This saves a lot of reaching for the press when operating.

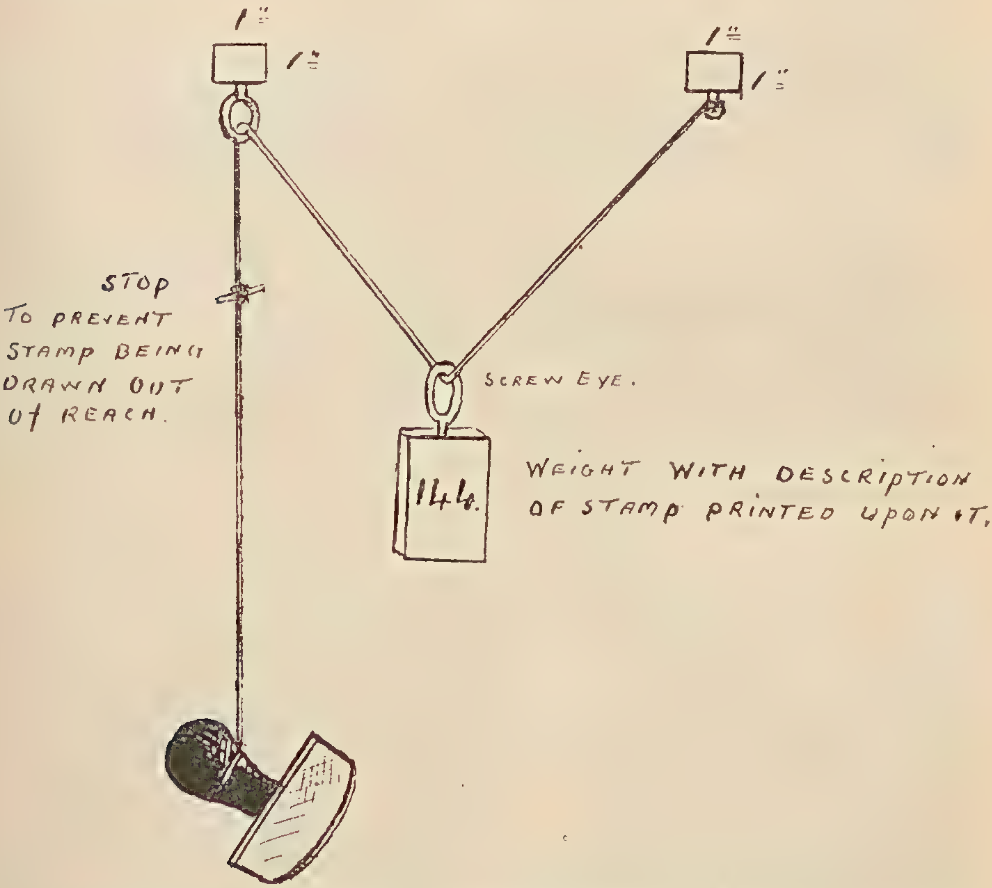


PLATE 38 (Fig. 10).—METHOD OF ATTACHING RUBBER STAMPS TO HANG OVER PACKING BENCHES.

Stencils.

Stencils are another necessity in the packing house, a grower needing sets of stencils for all varieties of fruit, sizes, and packing counts used; also a stencil plate with his name and full address as follows:—

J. SMITH,
Stanthorpe,
Queensland,
Australia.

This is necessary when a grower is going to export. A spare sheet of light gauge zinc, out of which stencils can be cut with a pocket knife, is a handy standby for emergencies.

A good inkpot to use for stenciling is easily made out of the bottom of a kerosene tin and a handful of cotton waste, a block of stencil ink, and the necessary water to saturate it without having any surplus. A block of stencil ink used this way will go many times as far as when used on a board as is the general practice.

Paste for Labels.

Growers using labels will find that ordinary flour paste is quite satisfactory for attaching labels. The addition of a small quantity of alum or bluestone will assist in keeping the paste indefinitely. Care should be taken to keep paste with bluestone added in enamel or porcelain containers only, as bluestone will soon corrode tinware.

Rubber Stamps.

If rubber stamps are used instead of stencil plates they can be placed over the sizing machines and packing benches on weighted strings, so that the packers will have them in easy reach and when used they will rise out of the way of the packer until required again. Rubber stamps should always be made with a convex face (Fig. 10), so that the stamp will print easily on the wooden end of cases. If made flat stamps will not print satisfactorily when slightly uneven ends are encountered.

Other necessary accessories for those sending fruit where it has to be handled more than once are wire-tying machines which save a lot of damage to cases. Corrugated case-end fasteners are also useful, repairs to split ends being quickly and neatly effected by this means. A time-saving implement for those who have a trade in small case lots and use tacks is a magazine label attacher. This will attach a label in one-tenth the time required with a hammer and tacks. The accessories described are necessary to all growers who desire to handle their fruit in as quick and economical a way as possible, and they should materially help in putting up an article that will compete, both inside and out, with any other article on any market in a way that will be a credit to Australia.

QUEENSLAND SHOW DATES.

Kilcoy: 2nd and 3rd July.
Home Hill: 3rd and 4th July.
Townsville: 7th to 9th July.
Gatton: 8th and 9th July.
Woodford: 9th and 10th July.
Cleveland: 10th and 11th July.
Charters Towers: 15th and 16th July.
Caboolture: 16th and 17th July.
Rosewood: 17th and 18th July.
Ithaca: 18th July.
Laidley: 22nd and 23rd July.
Nambour: 22nd and 23rd July.
Esk: 24th and 25th July.
Ayr: 24th and 25th July.
Mount Gravatt: 25th July.
Bowen: 29th and 30th July.
Cairns: 29th and 30th July.
Maleny: 29th and 30th July.
Royal National: 10th to 15th August.
Crow's Nest: 26th and 27th August.
Wynnum: 28th and 29th August.
Imbil: 2nd and 3rd September.
Enoggera: 12th September.
Beenleigh: 18th and 19th September.
Malanda: 23rd and 24th September.
Brisbane River Camp Draft: 25th and 26th September.
Rocklea: 26th September.
Kenilworth: 26th September.
Southport: 3rd October.
Nerang: 9th October.
Evelyn Tableland: 9th and 10th October.

PISÉ CONSTRUCTION OF FARM BUILDINGS.

By Officers of the Department of Agriculture.

IN many country districts, especially when far removed from the railway, it is difficult, and often very expensive, to obtain usual building materials, such as bricks, cement, iron, and even sawn timber. In such cases it is useful to know how to utilise to advantage a material that can be found almost anywhere, and which costs nothing except the necessary labour to procure it. Earth can be used in several ways for walls, and if properly manipulated generally affords satisfaction. One method of using earth, adopted largely in Mexico and South American States, is that known as Adobe (pronounced doby), which is really nothing more than sun-dried bricks, or blocks made of earth and clay and allowed to remain before use a sufficient time for them to become thoroughly hard. This material has been used in that form for hundreds of years in the countries named, and buildings still exist in good order after 200 years' exposure to the elements. There is, however, more labour in handling Adobe than in the more modern method of pisé construction. In the latter case one handling is sufficient, as there is no waiting for the bricks to dry before using in the wall, pisé being built *in situ;* drying is not therefore necessary. But even when using pisé it is an advantage to have a few blocks of Adobe handy for use in difficult positions, such as corners, fireplace openings, &c. Another useful method is known as Pug, or a mixture of chopped straw and mud, or, in some cases, long straw or grass may be used, thoroughly mixed with well-wetted earth in a hole in the ground; for mixing, a long fork or hoe is used, but if on a large scale, horse or some mechanical power should be available. No special appliances are required for this method of construction, as the material, after preparation, is simply laid on in successive layers about 12 in. or 18 in. thick, keeping them as upright and true as possible. The walls are then trimmed down by the spade or other suitable tools, and made all of one thickness and perfectly true and perpendicular. As the material is put together in a fairly wet condition, there is a certain amount of shrinkage, but is consolidates into a very hard mass and becomes very durable—warm in winter and cool in summer. The general wallwork can be done with unskilled labour, with proper supervision, but a skilled tradesman is necessary to cut out or trim up openings for doors and windows, and to keep the angles plumb. Very good and durable buildings can be erected on this system in the back country.

Ant-bed should prove an excellent material in districts where it is available in any quantity.

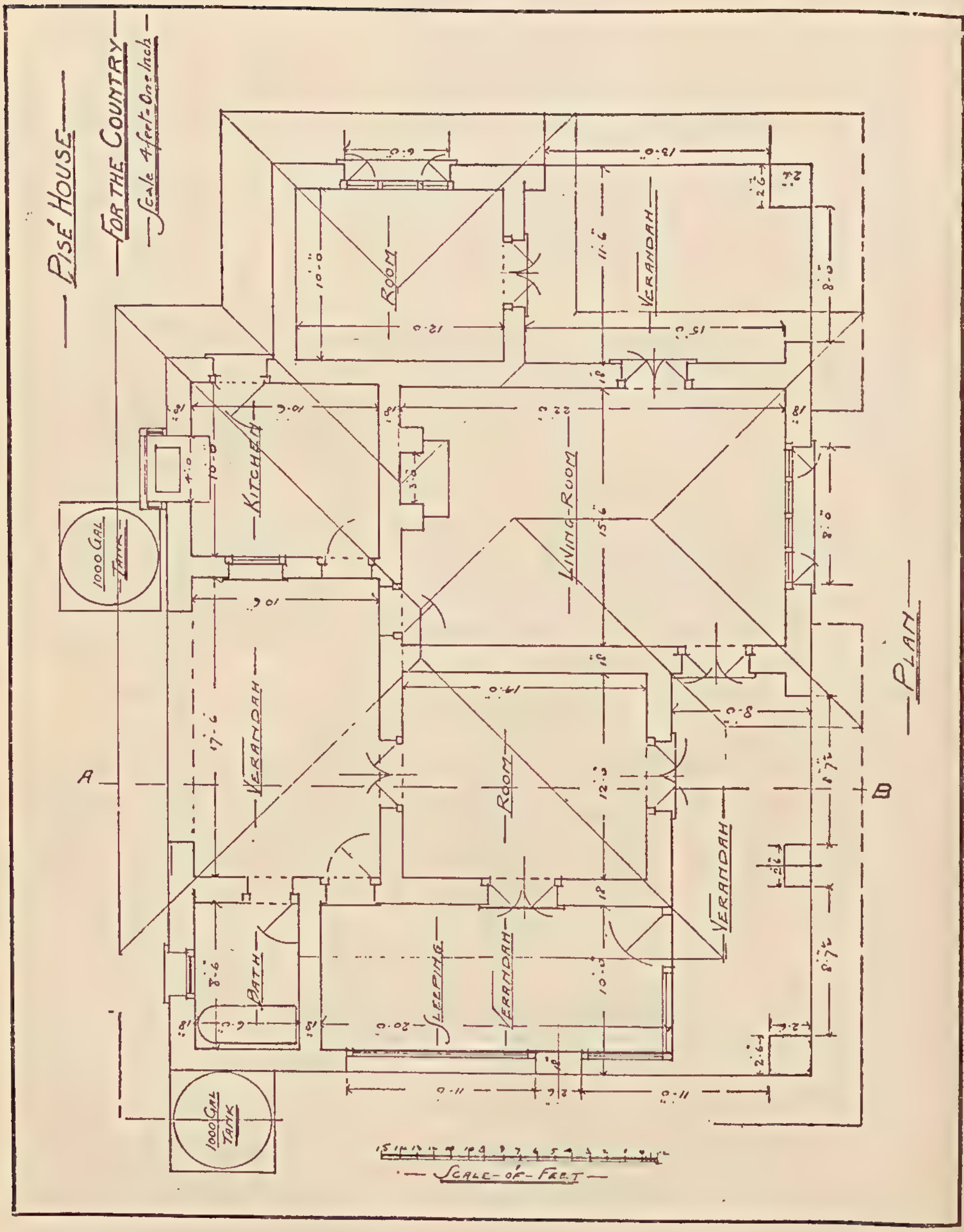
It is noted that an admixture of earth and clay is advocated. Clay, owing to its characteristics of expansion and contraction in wet and dry periods, respectively, has its drawbacks. In practice, a fine soil, free from sand or clay, is found to give the best results. A soil which, after being dried out, is difficult to reduce by agricultural methods to a fine tilth—unless crushing or rolling is adopted—is a desirable type.

Another type of earth building is somewhat akin to that known as wattle and dab, but very much superior. It consists of a framework of saplings set into a sill adzed on the top side and laid on the level ground. The corner and intermediate studs are framed into the sides, the intermediate about 3 ft. apart, with heads and sills to doors and windows. Both the outside and the inside of the studs are then covered with 1½-in. mesh wire netting, which is held together and kept from spreading by wire loops, the length of which is equal to the thickness of the wall. These loops are placed at sufficient distances apart to prevent the netting from bulging. The space between the netting is then filled with very moist earth and rammed. It will be seen that the walls will be just the thickness of the saplings or studs. These walls can, if necessary, be plastered on both sides, as the wire netting forms a good key for the plaster, then whitewashed or coloured as desired.

In some situations this type of building would be very serviceable, and if a little skilled attention were paid to the roofing, which might be of bark laid symmetrically and whitewashed or coloured, a very comfortable residence would result.

The type of structure, however, to which attention is specially directed, and to which the following specification refers, is that known as pisé, which combines all the good qualities of the others and may be erected by any person in the bush who is handy with tools and can use the level and plumb bob.

The accompanying drawings are intended to illustrate a house of this character, and, in order that the process of building same may be thoroughly understood, the specification is written in plain language, avoiding technicalities as far as possible.


PISÉ HOUSE
FOR THE COUNTRY
Scale 4 feet = One Inch
ROOM
VERANDAH
KITCHEN
LIVING-ROOM
1000 GAL TANK
VERANDAH
ROOM
VERANDAH
BATH
SLEEPING VERANDAH
1000 GAL TANK
A
B
PLAN
SCALE OF FEET

Where heavy rains are experienced, a modification of the roof system may be desirable, in order to give the walls greater protection from the elements. The bungalow-type of roof, with wide, overhanging eaves, lends itself excellently to pisé construction.

Plant and Materials.

Before commencing operations, the builder should provide himself with moulds for the walls, rammers, and other necessary articles, as he cannot perform good and durable work without them. The plant required will depend on the number of men employed, and, as three is the minimum number to perform the work economically, the following will be necessary:—A horse and dray or some other means of transporting the material to the building, two wooden rammers, two plasterers' wood floats, two straight boxes or moulds, two angle boxes, some short lengths of light wood for blocking up the ends of boxes, a supply of sawn scantling of different sizes, some ⅝-in. bolts, nuts and washers, gauge rods, shovels, spades, a watering can, buckets, tank or barrel for water, and some other articles which will be necessary as the work proceeds.

Foundations.

After collecting the plant and fixing the site, the first thing to do is to prepare the foundations. To do this the building must be accurately set out and the correct position and thickness of all walls pegged out, the pegs being put in about 3 ft. outside the intersection of walls, so that they are not disturbed when excavating the footings. It may be well to point out that, in setting out buildings perfectly square with walls at right angles, a good-sized square is necessary, which can be easily made by anyone out of long battens or flooring boards. The correct angle is assured by measuring one side 6 ft., the other side 8 ft., with the hypotenuse or diagonal between the above points exactly 10 ft., or any multiple of the same.

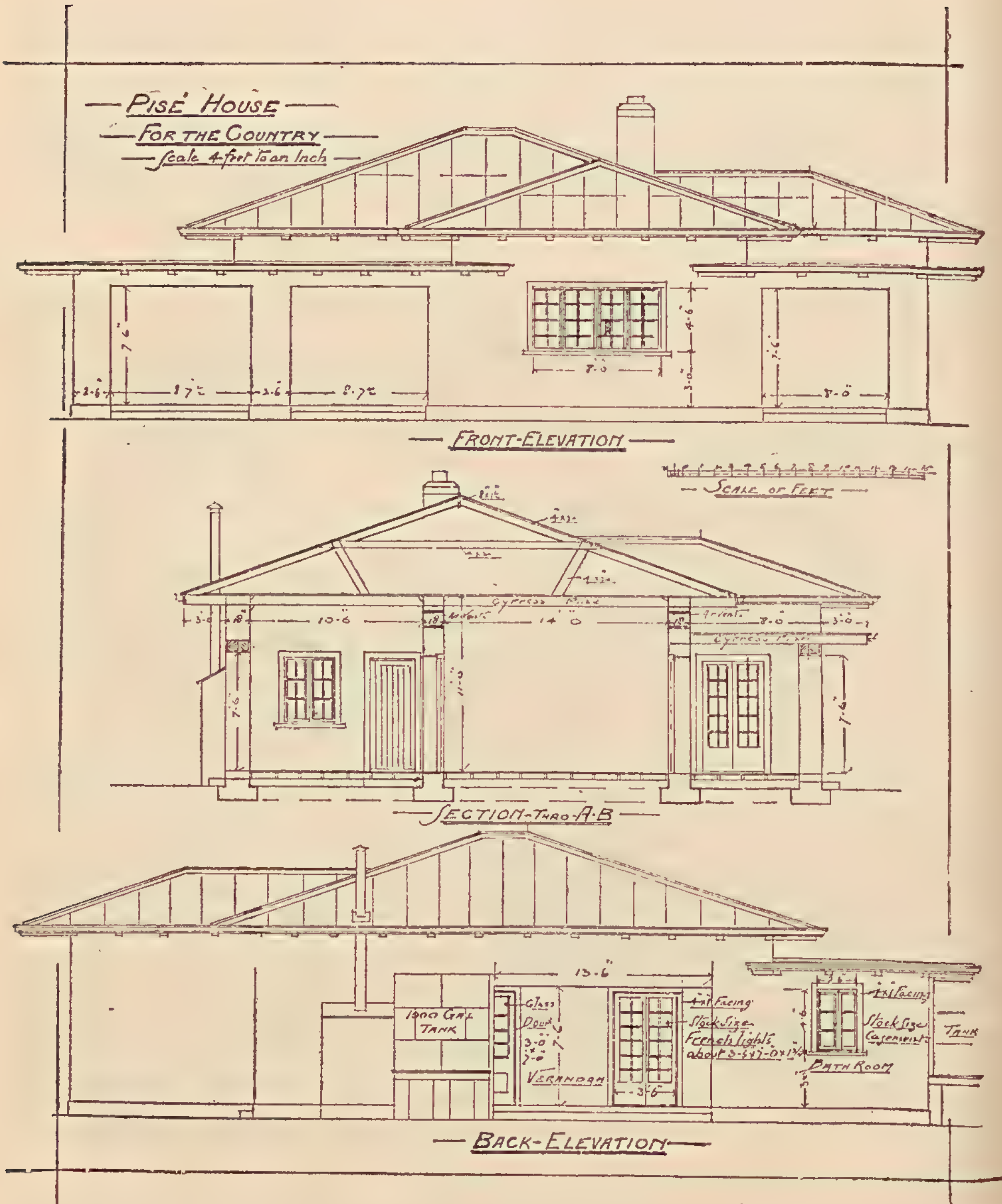
The footings of all walls should not be less than 9 in. wider than the walls they carry, projecting 4½ in. on each side. In suitable ground they need not be more than 4 in. in depth, which will be obtained by taking off the top sod to that depth. If the ground slopes, the footings should be stepped; that is, they should be excavated level for short distances, then a step should be left, and another length taken out level. These footings should then be well watered before placing any material in them; when filled in, they should be well rammed and made quite level and flat on top. Before proceeding with the walls, the boxes or mould must be prepared of any convenient size and of any kind of wood that will not twist or warp, the lighter the timber the easier it is to handle. It will be found generally that 2 ft. is a convenient depth for boxes for ordinary buildings, but for large buildings 3 ft. may be a more suitable depth. Twelve inch by 1½ in. boards, with ledges on the outside, will be found convenient, and a broad ledge or brace should be placed at each end. The ledges should be about 2 ft. apart, and ½-in. iron bolts, long enough to go through the walls, with heads, nuts and washers provided for bolting the boxes together. A set of one dozen iron angle-brackets should also be provided for securing the boxes at angles, otherwise it will be difficult to keep the angles plumb and true. Care must be taken in fixing the boxes to have them perfectly level and plumb, and a little time and patience in accomplishing this will often save much annoyance, resulting from the walls being out of plumb.

The door and window frames should also be prepared and ready for use when required, as they should all be built in as the work proceeds.

The next thing to do is to remove the turf from the ground and give the earth a fairly good soaking with water, so that when pressed together in the hand it will adhere and form a solid mass. It must not, however, be too wet, or it will not compress properly when rammed. All roots and timber should be taken out, also all large stones. Fill in the boxes from 6 to 12 in. high at one time, and well ram the same. The wall will then set firm and hard, and be impervious to storms.

A Damp Course Necessary.

The provisions of a damp course must not be neglected, as the ground moisture will gradually rise by capillary attraction, and cause discomfort in the rooms. This will probably not be noticed for a long time after completion, but as the earth is always more or less damp, sooner or later, unless prevented by some means, its effects will be seen and felt. In brick and stone buildings special damp-proof courses are built in, just below the ground floor level; and in pisé construction a good damp course may be formed by building in the wall, for its whole width, just above the ground line, a sheet of malthoid (1 ply), which will be thoroughly effective. This should be carried through all door and french light openings, and lapped 6 in. at joints.


PISÉ HOUSE
FOR THE COUNTRY
Scale 4 feet to an Inch
FRONT-ELEVATION
SCALE OF FEET
SECTION-THRO-A-B
1000 GAL TANK
Glass Door
3-0 x 7-0
VERANDAH
Stock Size French lights
BATH ROOM
Stock Size Casements
TANK
BACK-ELEVATION

General Specifications.

All door and window openings should be boxed up carefully as near as possible to the finished sizes, so that little or no patching up will be required.

Cypress pine plugs should be built in all door and window jambs, heads and sills, as shown on detail drawings. These are necessary for securing frames and linings, and to a large extent will make subsequent plugging unnecessary.

All openings should have good Cypress pine lintels, having at least 1 ft. bearing on the walls at each end, those over verandah openings to be whole logs adzed on the underside, resting 18 in. on the wall at each end, each face of the same to have stout nails driven in a few inches apart, which will form a key for a plaster cover. The faces of these lintels may be lined with Cypress pine, or they may be covered with cement compo, or lime plaster with a small quantity of cow's hair mixed in same; the nails before mentioned will form a key to hold it to the timber, and, when floated off with a wood float and finished with the pisé wall, will be durable and effective.

In districts where cement can be conveniently obtained, the heads and sills of ordinary openings could be made of cement concrete in the proportion of six parts gravel, containing a good proportion of sand, and one part of cement. These could be reinforced and made very strong by inserting in same a few strands of barbed wire turned over at the ends so as to prevent them drawing out.

The fireplace should be faced with brick or concrete, the hearth laid with cement, and the chimney built either of brickwork with a 9-in. flue or of concrete with a 9-in. drain pipe built in for the flue, finished on top with a flue pipe projecting about 6 in. above a bevelled cap.

All the pisé walls—both sides—should be lightly sprinkled with water and worked over with the wood float, using screeds where any straightening is required.

The top plates should be secured in position on the walls, as shown in detail drawing.

Openings to be left in all walls for ventilation just below the ceiling line, by building in boxes specially prepared and of suitable sizes, ventilators to be not less than 2 ft. 6 in. by 1 ft. 6 in., and to be placed generally over doors and windows.

Build in woodplugs 4 in. by 2 in. and the thickness of the walls at intervals of 3 ft. for securing skirtings, dados, picture rails, architraves, &c.

CARPENTER AND JOINER.

Joists to be of 5 in. by 2 in. Cypress pine resting on 4 in. by 2 in. plates on the walls and on piers where the bearing exceeds 10 ft. Joists to be spaced 18 in. apart, centre to centre; verandah floors to be laid with a fall outwards of 1½ in. where exposed to the weather.

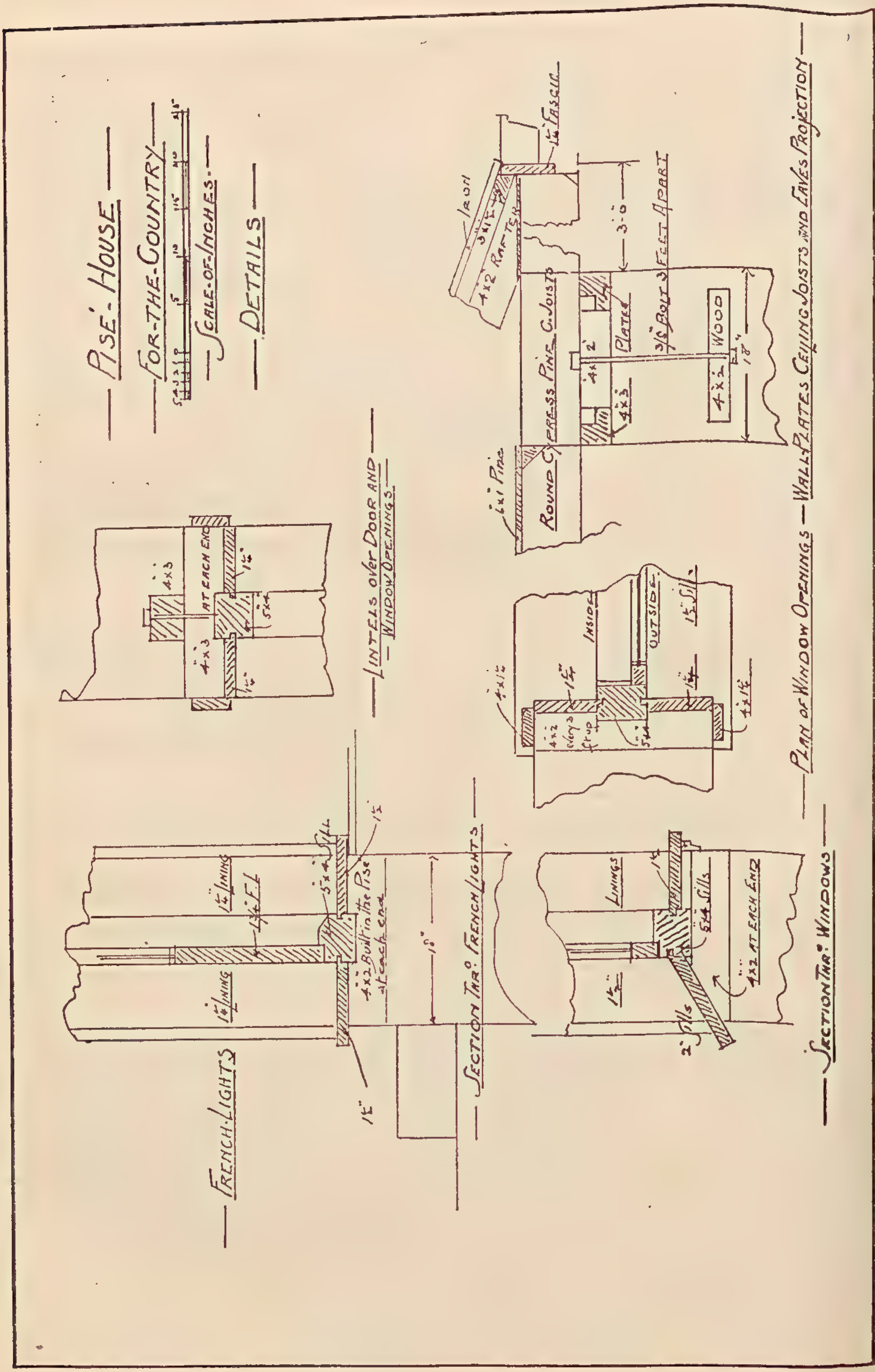
Provide ready for building in, and mark the correct position for all plugs, stays, and braces, also all plates, and provide and carefully fix all door and window frames as shown on detail drawing.

All door and french light frames to be 5 in. by 4 in. solid Cypress pine, with heads and weathered and sunk sills grooved for tongue of linings and fitted with stops, &c., necessary for door hanging.

If preferred, the grooving in the frames may be dispensed with in most cases, and a fillet nailed on the back of the solid frame to which the lining can be nailed.

All door, french light, and window frames to have 1¼-in. Cypress pine wrought linings, tongued into the frames or nailed securely to fillets at the back of the frames, to be finished on both sides with 4 in. by 1¼ in. plain chamfered architrave. Windows to have 1½-in. sills on the inside, with 2-in. nosing and scotia under and a 2-in. sill on the outside, laid to a bevel with returned ends, sufficiently wide to carry the architrave. French lights to have 1½-in. sills both sides, in addition to the solid 5 in. by 4 in. sill of the frame. Window frames to have mullions, as shown, with all necessary stops for casements. Four inch by 2 in. wood plugs to be built into walls every 3 ft. in height of opening to nail linings and architraves to. Ceiling joists to be of Cypress pine, round timber, not less than 7 in. in diameter, adzed flat on the top for receiving the ceiling linings; joists to be spaced not more than 3 ft. centres, and to be notched into wallplates, and extend 3 ft. over the face of wall, the ends of same to be cut off true to line for fascia board, and cut slightly back below the fascia.

Ceiling joists of verandahs to be similar to the above, trimmed into each other where necessary, and spaced not more than 3 ft. apart, centre to centre.


PISÉ HOUSE
FOR THE COUNTRY
SCALE OF INCHES
DETAILS
FRENCH LIGHTS
SECTION THRO' FRENCH LIGHTS
LINTELS OVER DOOR AND WINDOW OPENINGS
PLAN OF WINDOW OPENINGS
SECTION THRO' WINDOWS
WALL PLATES CEILING JOISTS AND EAVES PROJECTION
ROUND CYPRESS PINE C. JOISTS
4 x 2 RAFTER
IRON
FASCIA
PLATES
3/8" BOLT 3 FEET APART
WOOD
INSIDE
OUTSIDE
LININGS
5 x 4 SILLS
AT EACH END

Rafters, collars, and braces to be 4 in. by 2 in. sawn Cypress, spaced to suit the ceiling joists, bevel cut where necessary, and securely nailed. Ridge to be 8 in. by 1¼ in., eaves fascia dressed 7 in. by 1¼ in., battens 3 in. by 1½ in., spaced so as to have not less than three battens under every sheet. Batten up valleys and hips with an extra thickness at eaves.

Lay all floors with 6 in. x 1 in. grooved-and-tongued Cypress pine flooring, well cramped up, and nailed with two nails to each joist and dressed off at completion.

Ceilings and soffits of eaves to be lined on top of ceiling joists with 6 in. by 1 in. t. and g. Cypress pine, with scotias and fillets at all angles.

Build in walls plugs for nailing skirtings, chair rails, picture rails, &c., at suitable distances apart, plugs to be of such size as to be completely covered by the timber work to which they are nailed.

Fix round inside walls of all rooms 6 in. by 1 in. chamfered skirting, scribed to the floor and to architraves.

Fix 4 in. by 1½ in. chair rail, chamfered on edge, round the walls of living room, bedrooms and kitchen, and 2 in. by 1½ in. pictures rail round the same rooms.

Build the stove recess in kitchen, as shown on drawings, with 3 in. by 2 in. studs, lined with iron on the outside, and finished as shown, with cement hearth. Two small lights to be built in recess, fitted with 1½ in. rebated frames with 16 oz. sheet glass, and hung on pivots with cords for opening same and suitable fasteners.

Frame for outside wall of sleeping verandah with 4 in. by 3 in. studs on a 4 in. by 2 in. bottom sill and capping piece, with a 6 in. by 2 in. weathered and throated sill projecting 2 in. from the face of the wall, and a 4 in. by 2 in. top plate. Studs and mullions to run through from bottom to top, and checked into head. Panels below openings to be filled in, either with 4 in. by 1 in. g. and t. Cypress pine or with fibro-cement sheeting ¼ in. thick, and secured in position with fillet on both sides.

Fix 12 in. by 1½ in. mantel shelf and jambs to kitchen fireplace, and a pine mantel and jambs to the living room.

Fix 50 ft. super of 12 in. by 1 in. shelves in kitchen, on brackets properly secured to wall plugs.

Provide and fix tank-stands, where shown, with hardwood or Cypress pine stumps, and hardwood joists, and 6 in. by 1½ in. sheeting.

French lights to be 3 ft. 6 in. by 7 ft. by 1¾ in. pine with moulded and rebated bars 1 in. thick, double hung with 4 in. butts, and fitted with two bolts on the inside, and rebated mortise locks with brass or oak furniture.

Doors in kitchen to be 1¾ in., framed and ledged and filled in with 1 in. g. t. and v.-jointed pine, hung with 4 in. butts and fitted with 6 in. rim locks with brass furniture.

Door from living room to back verandah to be 1¾ in. framed with moulded, rebated and glazed panels hung with 4-in butts and fitted with rim lock as before.

Other doors to be 1¾ in. four panelled pine, hung as before, and fitted with 6 in. rim locks with brass furniture.

All windows throughout to have 1¾ in. pine casements with moulded and rebated bars 1 in. thick, glazed with 16 oz. sheet glass, well sprigged, puttied and back puttied, hung with 3 in. butts and fitted with bronze casement fasteners and 4 in. bolts. All casements, where possible, to be hung to open outwards.

All doors and windows throughout to be fitted with stops the necessary widths and thickness required.

Fix bronze hooks in suitable position for fastening back french lights and doors.

Fix in each room over door and window openings lattice work ventilators made with openings 1 in. square, 2 ft. 6 in. by 1 ft. 6 in., and provide all necessary stops and linings to same.

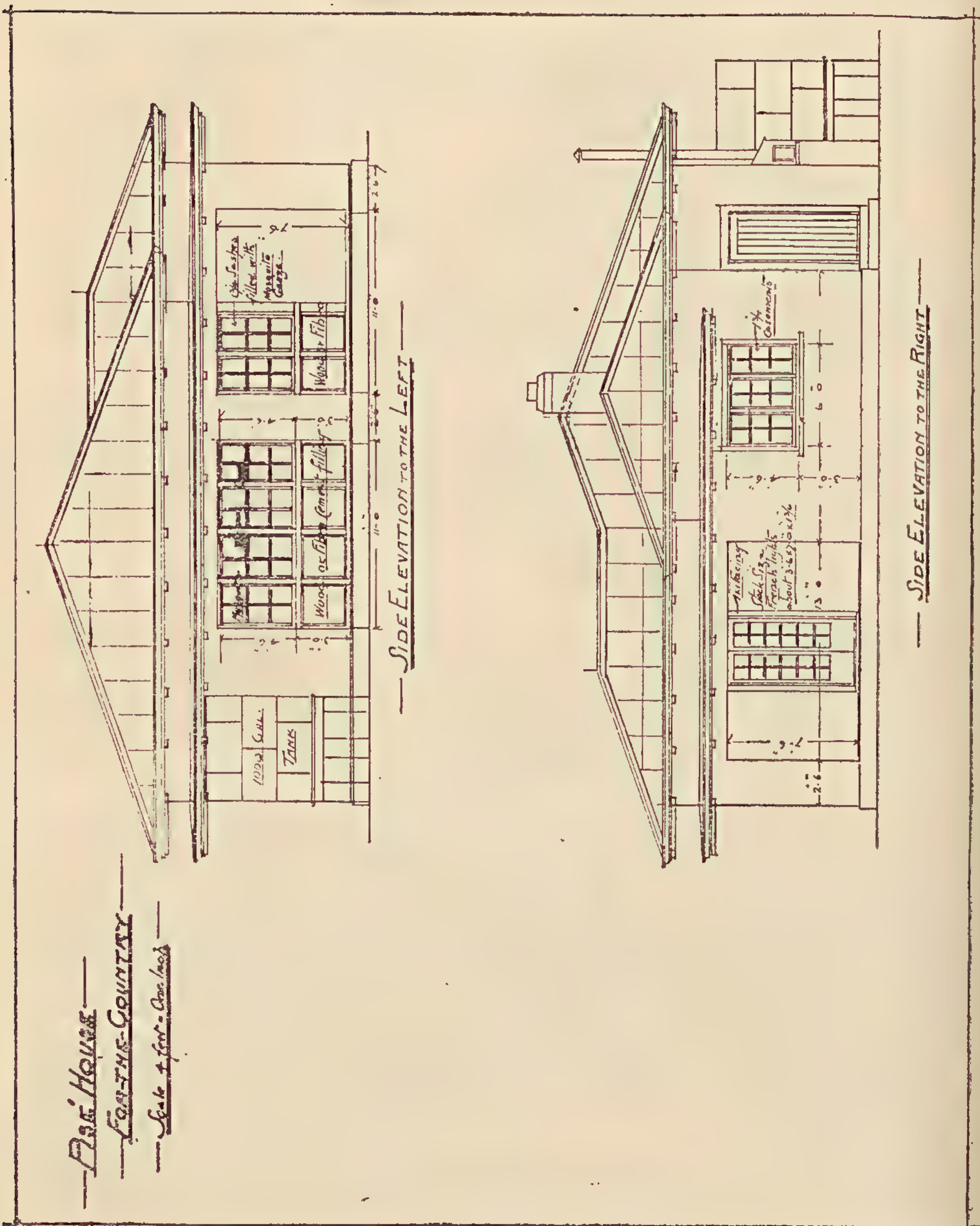
Finish round all doors, windows and other openings with 4 in. by 1 in. chamfered architraves on both sides.

Fill in sashes on sleeping verandah with mosquito-proof wire gauze, and fix same with stops on both sides, well secured.

These sashes may be made with bars 1 in. thick, moulded on the outside, but left flush at the backs, so that the mosquito-proof gauze will pass over the bars and be secured with a stop planted on the back.

Provide and fix, where pointed out, one dozen bronze hat and coat hooks on 5 in. by 1 in. chamfered rails, and provide and fix in kitchen one dozen cup hooks.

Do all the work necessary to complete this branch in a satisfactory manner.


FOR THE COUNTRY
SIDE ELEVATION TO THE LEFT
TANK
SIDE ELEVATION TO THE RIGHT

PLUMBER.

Roof of verandahs to be covered with 2-ply malthoid, laid as instructed by the selling agents, on close boarding provided and fixed by the carpenter, turned up against walls, properly flashed, and joints cemented as instructed by agents, to be left perfectly sound, weatherproof, and satisfactory.

Five inch by 4 in. galvanised-iron spouting to be fixed to all eaves, on brackets as required, with soldered points, stop ends and angles. Water to be conducted to the tanks with all necessary 3 in. down pipes.

Other roofs than the above to be covered with 26-gauge galvanised iron, approved brand, laid with 1½ in. corrugation at sides and 6 in. at ends. Valleys to be laid as shown, with 24-gauge plain iron; cover hips and ridges with 24-gauge 16 in. wide, lead-headed nails to be used throughout.

Provide and fix two 1,000-gallon tanks, with mosquito-proof hoppers and frog-proof overflows, fitted with cleansing plugs and lever taps.

Provide and fix a 5 ft. 6 in. galvanised-iron corrugated bath, with waste plug and chain. Connect a 2½ in. waste pipe to same, and convey it to a suitable position outside to be approved.

Provide and fix over same shower bucket with rose and lever tap cords, pulleys and block for hoisting and lowering.

Cover inside walls of bathroom up to a height of 5 ft. with small corrugated galvanised-iron sheeting, with roll on top.

Provide and fix a stove in kitchen, value £ net cost; fix stove piping, and carry up same above roof, flashed where necessary.

PAINTER.

Knot, stop, rub down and properly prepare all wood and iron work for painting which is usually painted, such as eaves, gutters, down pipes, fascias, outside doors, and windows. All the above woodwork to be painted three coats approved colours with approved linseed oil and white lead, ironwork to have two coats only.

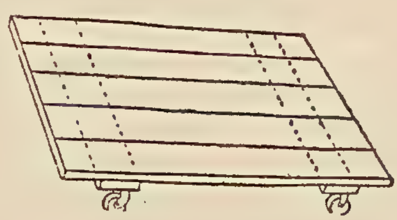
Inside doors and windows, skirtings, picture rails, chair rails, &c., to have two coats of best approved varnish.

All outside walls to be twice coated with limewash containing half a pint of raw linseed oil to each gallon, and inside walls to be coated with limewash as above, but coloured by the addition of any suitable dry colours.

For a better painting job, a coating of the exterior walls with boiled oil in which pigments of the desired shade of colour have been mixed, is advised. The boiled oil forms a distinct skin, which in itself is a protection. Inside walls may be coloured with cold-water paints, of which many beautiful shades are on the market.

DOLLY FOR THE SHED.

When any great number of bales of produce have to be moved, it becomes a heavy and tiresome job. To render some of this work easier, a dolly, as shown in the sketch, can easily be constructed from odds and ends. Build a small plank platform of boards, say the length of the general run of bales to be moved, and



cleat them solidly from underneath with stout boards. Fasten four roller-bearing castors, one near the end of each cleat. Wheels from a pair of old roller skates will answer the purpose equally well.—"New Zealand Farmer."

THE BUFFALO FLY.

MINISTERIAL STATEMENT.

The Deputy Premier (Mr. R. M. King), in referring recently to the official announcement of the Federal Government on the Buffalo Fly menace, disclaimed any knowledge of a statement made by the Queensland Government that the existence of the fly had been ignored by the Commonwealth authorities prior to 1930.

The Queensland Government, apprehending the danger of the introduction of the fly into this State from territory under the jurisdiction of the Commonwealth Government, requested that Government, as far back as 1927, to make every effort to bring the pest under control and prevent its extension into Queensland. Efforts made, if any, were obviously futile, and the pest spread into this State and was located in the extreme north-western corner in 1928.

Had the Commonwealth Government, when appealed to in 1927, taken action to create a buffer area within their territory, as was suggested by the Queensland authorities, the progress of the fly to the border would probably have been stopped, and the present unfortunate position, so far as it affects this State, would not have arisen.

A Queensland Quarantine.

The suggestion that the Queensland authorities are inactive in dealing with the menace was scouted by the Acting Premier. Quarantine restrictions were imposed within the infected or suspected area in 1929. This area approximated 6,000 square miles, not 60,000 square miles as appears in the statement of the Federal Government. From time to time since the establishment of this quarantine area, the State Government has made efforts to secure the co-operation of the Commonwealth Government in any definite measures which could be taken to control the pest, but without result.

Co-operation with the Commonwealth.

Mr. Moore stated that his Government was quite prepared to co-operate with the Commonwealth in any measures taken to arrest the progress of the fly, but apparently the Commonwealth Government was not anxious to definitely co-operate in any scheme which provided for the establishment of buffer areas or the evacuation of infested territory in this State.

A passage from Dr. Gilruth's conclusions, to the effect that "known means of coping with the pest are mostly futile and all quite impractical in Australia's infested area" is illuminating. Apparently in his opinion the utilisation of the services of a natural enemy, which it is assumed is the alternative, would only result in the diminution of the numbers of the pest. If these conclusions are correct the State Government would certainly not be justified in expending an enormous amount of money on the attempted control of this pest without reviewing the matter from every angle in the light of experience gained elsewhere.

Why, continued Mr. King, should Queensland be called upon to bear this expense when the source of the trouble emanated from Commonwealth territory, and should, therefore, be dealt with as a national matter.

A point was made of the fact that in 1924 the State Government declined to co-operate with the Commonwealth Government to the extent of £1,000 on a £1 for £1 basis to carry out investigations into the pest. At this period the fly was some hundreds of miles from the Queensland border, and only the Commonwealth and West Australian Governments were directly interested.

When Queensland was desperately fighting to prevent an extension of the tick pest and expended large sums of money in doing so, no suggestion was made that the Commonwealth Government or other State Governments should come to the rescue, nor was any financial assistance supplied.

The Prime Minister is well aware of the fact that both the Commonwealth Government and the Queensland Government are awaiting reports on a survey of the infested area, which is now being made by officers connected with the Council for Scientific and Industrial Research and officials of the Queensland Department of Agriculture and Stock, and that future action will be based on the results of this survey. The Minister for Agriculture and Stock (Mr. H. F. Walker), realising the importance of this problem, is now in the infested territory, accompanied by officials of his Department, as he is desirous of securing first-hand information which could be placed at the disposal of the Government.

The allegation that press propaganda had been indulged in for the purpose of attempting to place the blame for the Buffalo Fly position on the Federal Government was referred to by Mr. King as not worthy of serious comment.

The position is plain to all who are vitally interested in the menace, which in its extension from Federal territory to other portions of the Commonwealth now presents a national problem of vital interest to the whole of Australia.

Referring to the allegation that no reply was sent by the Premier to the Commonwealth Government's offer in its letter of 3rd April to negotiate as to the proportion of the expenses it would be equitable to charge to that Government, Mr. King pointed out that on the 18th April the Premier, in a telegram to the Prime Minister, offered to confer with the Minister for Home Affairs either in Sydney or Melbourne while he was in the South attending a meeting of the Loan Council the following week. Although Mr. Moore made every endeavour to arrange a meeting with one of the Federal Ministers on the matter, he met with no success in securing the desired conference.

BLACKLEG.

LIKE anthrax, blackleg is a stationary infective disease confined to certain pastures or districts. It is spread more or less over all the world, preferring damp marshy soils, also in hilly country. Like anthrax it is a spore-bearing bacillus, but it is anærobic (that is just the opposite to anthrax). It lives and thrives only where free oxygen is excluded. The germ enters the system by minute cuts on the surface of the body, probably through the alimentary tract. As a rule, only cattle between the ages of three months and two years are attacked, such attacks being very exceptional with older cattle. The disease also sometimes attacks sheep, and sheep of any age may become affected. One attack, if followed by recovery, confers absolute immunity to the disease. It seems that most other domestic animals and man are immune. The flesh of cattle affected with blackleg can be consumed by man, dog, or pig without ill effects. Such is not so with anthrax.

Symptoms.

The course is very rapid; death occurs in one and a-half to three days. The disease is characterised by a rapidly increasing swelling of the skin tissue, &c. (which crackles on being touched), high temperature, lameness, &c.

The swelling of quarter ill (in rare cases it does not occur) may appear on different parts of the body. It is chiefly confined to one or more of the great muscular masses (rump, shoulder, neck). It never appears below the knee or hock. The swelling is at first small and painful, it rapidly enlarges to an enormous size, crackles and gurgles when the hand is rubbed over it, and feels as if the tissue is full of air. The central part of the swelling becomes cold, dried up, and dead looking. If cut into with a knife it is painless, and a dark and frothy fluid runs away and smells like rancid tallow. The lymph glands in the neighbourhood are greatly swollen and can be easily felt under the skin. The animal shows all the general symptoms of a sick animal—its appetite is dull, breathing is rapid, &c., lameness is present if a limb is affected, and is usually excessive, and at first sight one concludes that the animal has a broken leg. There is great lameness and stiffness and the limb is dragged.

Post Mortem.

The skin covering the swellings of quarter ill changes to a dry condition of gangrene. The subcutaneous tissue is infiltrated with blood and contains gas bubbles, which escape if the tumour is cut. The muscles beneath are dirty brown, blackish dark red, or dark yellow. They are friable and rich in fluid, and if cut the greasy, frothy, tarry blood runs away and has a rancid smell. The lymph glands of the part are swollen and full of watery blood, and the spores and bacilli are abundantly present. Other parts of the system may appear normal or may show hæmorrhage into the tissue; the spleen is normal; the blood generally appears normal and readily clots.

Treatment.

In the majority of cases the animal is either dead or too far gone when discovered. In any case as a general principle treating the affected animal is useless, being expensive and in most cases unavailing. The proper thing to do in this twentieth century of modern medicine is not to cure disease, but to prevent it. The way to prevent disease is by using "Blackleg Aggressin" and other medicine specially made for the same purpose. This Blackleg Aggressin is prepared in Australia wholly with Australian industry; every particle from the microbes, calves, boxes, labels, &c., are made in Australia. The Aggressin is prepared in two forms—viz., (1) liquid form, (2) solid form. Both are highly efficient, as also are other vaccines made with the same object, and equally successful in their results.

AGRICULTURE ON THE AIR.

RADIO LECTURES ON RURAL SUBJECTS.

ARRANGEMENTS have been completed with the Australian Broadcasting Company for the regular delivery of radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from 23rd July, a fifteen minutes' talk, commencing at 7.30 p.m., will be given on subjects of especial interest to farmers.

Following is the full list of lectures already arranged, and readers will observe the comprehensive field in the science and practice of agriculture, animal husbandry, and rural economics covered by the subjects chosen:—

SCHEDULE OF LECTURES
BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK.
RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMPANY).

Thursday, 23rd July, 1931—"Agriculture—Ancient and Modern." J. F. F. Reid, Editor, "Queensland Agricultural Journal."

Tuesday, 28th July, 1931—"The Importance of Dairying." C. F. McGrath, Supervisor of Dairying.

Thursday, 30th July, 1931—"Irish Blight of Tomatoes and Potatoes." R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Tuesday, 4th August, 1931—"Citrus Melanose." L. F. Mandelson, B.Sc., Assistant Plant Pathologist.

Thursday, 6th August, 1931—"Harvesting and Marketing Queensland Citrus Crop." J. Gregory, Instructor in Fruit Packing.

Tuesday, 11th August, 1931—"Brisbane Ram Sales and the Sheep and Wool Show Exhibit." J. Carew, Senior Instructor in Sheep and Wool.

Tuesday, 18th August, 1931—"Wattles or Acacias." C. T. White, Government Botanist.

Thursday, 20th August, 1931—"The World's Breakfast Bacon." E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Tuesday, 25th August, 1931—"Marketing Eggs." P. Rumball, Poultry Expert.

Thursday, 27th August, 1931—"Tuberculosis in Farm Animals." C. J. Pound, Government Bacteriologist.

Tuesday, 1st September, 1931—"Economic Entomology." Robert Veitch, B.Sc., Chief Entomologist.

Thursday, 3rd September, 1931—"Cane Cultivation." Dr. H. W. Kerr, M.Sc., Ph.D., Sugar Soil Chemist.

Tuesday, 8th September, 1931—"The Outlook for the Pastoral Industry." J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 10th September, 1931—"Buffalo Fly." F. H. S. Roberts, M.Sc., Entomologist.

Tuesday, 15th September, 1931—"Orchards and Fruit Gardens." W. J. Ross, Senior Instructor in Fruit Culture.

Thursday, 17th September, 1931—"Meat Hygiene—Its History and Development." H. G. Cheeseman, Senior Slaughtering Inspector.

Tuesday, 22nd September, 1931—"Sugar Cane Diseases." A. F. Bell, Plant Pathologist.

Thursday, 24th September, 1931—"The Preparation and Use of Vaccine in the Treatment of Contagious Mammitis in Dairy Cows." St. G. Thorn, Assistant Bacteriologist.

Tuesday, 29th September, 1931—"Travelling Stock by Road, Rail, and Sea." W. C. Carmody, District Inspector of Stock.

Thursday, 1st October, 1931—"Cut Worms and Army Worms." J. A. Weddell, Assistant Entomologist.

Tuesday, 6th October, 1931—"Flag Smut of Wheat." R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Thursday, 8th October, 1931—"The Care of Growing Poultry." J. J. McLachlan, Poultry Inspector.

Tuesday, 13th October, 1931—"A Poultry Mite Infesting Dwellings." F. H. S. Roberts, M.Sc., Entomologist.

Thursday, 15th October, 1931—"Red Stripe or Top Rot in Sugar Cane." W. Cottrell Dormer, B.Sc.Agric., Assistant Pathologist.

Tuesday, 20th October, 1931—"Cotton Cultivation." R. W. Peters, Cotton Experimentalist.

Thursday, 22nd October, 1931—"Care of Cow after Calving." J. A. Rudd, L.V.Sc., Government Veterinary Surgeon.

Tuesday, 27th October, 1931—"Plant Growth and Nutrition." H. Barnes, Instructor in Fruit Growing.

Thursday, 29th October, 1931—"Stock Feeds and Feeding." E. H. Gurney, Senior Analyst.

Tuesday, 3rd November, 1931—"Queensland's Official Poultry Stud." P. Rumball, Poultry Expert.

Thursday, 5th November, 1931—"Producer and Consumer in the Pork Products Campaign." E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Tuesday, 10th November, 1931—"Timber Borers in Houses." Robert Veitch, B.Sc., Chief Entomologist.

Thursday, 12th November, 1931—"Fruit Fly." J. A. Weddell, Assistant Entomologist.

Tuesday, 17th November, 1931—"Diseases and Insect Pests of Cotton." R. W. Peters, Cotton Experimentalist.

Thursday, 19th November, 1931—"The Scrubs or Rain Forests of Australia." W. D. Francis, Assistant Botanist.

Tuesday, 24th November, 1931—"Soft Fruit Packing—Its Troubles and How to Overcome Them." J. Gregory, Instructor in Fruit Packing.

Thursday, 26th November, 1931—"The Pastoral Industry and Research Work." J. L. Hodge, Instructor in Sheep and Wool.

Tuesday, 1st December, 1931—"The Value of Bird Life." W. D. Wilson, Ranger, Animals and Birds Acts.

Thursday, 3rd December, 1931—"The Production of Clean Milk." O. St. J. Kent, B.Sc., Analyst.

Tuesday, 8th December, 1931—"The Calf—Care in Health and Disease." J. A. Rudd, L.V.Sc., Government Veterinary Surgeon.

Thursday, 10th December, 1931—"Water Blister of Pineapples." L. F. Mandelson, B.Sc., Assistant Plant Pathologist.

Tuesday, 15th December, 1931—"Influence of Butter Grading on the Industry." G. H. E. Heers, Senior Grader.

Thursday, 17th December, 1931—"Cattle Tick Eradication Problems." C. J. Pound, Government Bacteriologist.

Tuesday, 22nd December, 1931—"The Origin of the Angora Rabbit—Its Wool as an Article of Commerce." J. W. Munro.

Tuesday, 12th January, 1932—"Propagating Fruit Trees." W. J. Ross, Senior Instructor in Fruit Culture.

Thursday, 14th January, 1932—"Eucalypts or Gum Trees." C. T. White, Government Botanist.

Tuesday, 19th January, 1932—"Why Dairy Association Pays Differ." G. B. Gallwey, A.F.I.A., Inspector of Accounts.

Thursday, 21st January, 1932—"Prospects for Fat Lamb Production in Queensland." J. Carew, Senior Instructor in Sheep and Wool.

Tuesday, 26th January, 1932—"Fertilization of Sugar Cane." Dr. H. W. Kerr, M.Sc., Ph.D., Sugar Soil Chemist.

Thursday, 28th January, 1932—"Selection and Origin of New Varieties of Plants." H. Barnes, Instructor in Fruit Culture.

Tuesday, 2nd February, 1932—"Biological Control of Pests." Robert Veitch, B.Sc., Chief Entomologist.

Thursday, 4th February, 1932—"Tick Fever and How Protection is Afforded." St. G. Thorn, Assistant Bacteriologist.

Tuesday, 9th February, 1932—"Malnutrition on Some Sheep Areas in Queensland." J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 11th February, 1932—"The Culling of Poultry." J. J. McLachlan, Poultry Inspector.

Tuesday, 16th February, 1932—"Soils and Fertilizers." E. H. Gurney, Senior Analyst.

Thursday, 18th February, 1932—''Mammitis.'' J. A. Rudd, L.V.Sc., Government Veterinary Surgeon.

Tuesday, 23rd February, 1932—''Weather and Climatic Effects on Soils.'' W. J. Ross, Senior Instructor in Fruit Culture.

Thursday, 25th February, 1932—''Cotton Classing and Grading.'' W. G. Wells, Cotton Specialist.

Tuesday, 1st March, 1932—''Cotton Experimental Work.'' W. G. Wells, Cotton Specialist.

Thursday, 3rd March, 1932—''The Farmer and His Market.'' J. F. F. Reid, Editor, ''Queensland Agricultural Journal.''

Tuesday, 8th March, 1932—''The Honey Bee.'' H. Hacker, Entomologist.

Thursday, 10th March, 1932—''Eradication of Disease in Pigs.'' J. A. Rudd, L.V.Sc., Government Veterinary Surgeon.

STRAWBERRY CULTURE.

EXPERIMENTS AT PALMWOODS.

The Director of Fruit Culture, Mr. George Williams, has received the subjoined report (29th May, 1931) from Mr. R. L. Prest, Instructor in Fruit Culture, on the strawberry experimental plot at Palmwoods.

MAIN attention is being concentrated on the Aurie variety. The plants were secured from Montville with a view to obtaining a superior strain to replace those under cultivation generally in the district. They are forming fine plants and all budding freely, and at present appear a very fine nucleus from which to secure a good selection.

Phenomenals, which are gaining popularity in the district, are also under trial; plants were obtained from Buderim and Eudlo. The Buderim plants are large and well formed, giving great promise for suitable selection. Eudlo plants are also looking very well.

In addition to these main varieties a number of other varieties are being tested.

Aird's Variety.—This is an unknown variety secured from Mr. Aird, Woombye.

Cresswell, King Edward, and Wilba, secured from the Lawnton Acclimatisation Gardens, are growing strongly.

Spackman's Seedling.—A very vigorous growing seedling submitted by Messrs. Spackman Brothers should prove of value if it fruits as well as it grows.

Mr. Holland's cross between a Marguerite and Phenomenal is also included. These plants were received very late in the season and are consequently rather backward.

Manurial Trials.

Artificial manuring trials are also being carried out, the fertilizer being donated by A.C.F. and Shirleys Fertilizers Limited. Block A is receiving dressings of Q 5 fertilizer, and block B is receiving dressings of A.C.F. 4.

To date the plot is singularly free from disease. At one period aphis made its appearance, but was effectively checked by an application of Nico Dust. Azurine dustings have been carried out as a preventive against fungi troubles.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

OBITUARY.

The subjoined obituary notices are published with profound regret.

MR. R. G. RIDGWAY.

Mr. R. G. Ridgway, who was well known as the Metropolitan Inspector of Dairies, of the Department of Agriculture and Stock, died suddenly on 12th June. He was 67 years of age. Mr. Ridgway joined the Department in 1905, and throughout his service was attached to the dairy section. Mr. Ridgway was an efficient officer and the deep respect in which he was held by his fellow officers and a wide circle of friends was shown by the large attendance at his graveside. He had one son killed in action in the war, and is survived by his widow and grown-up family.

MR. J. T. TOD.

Knocked down by a motor car at Toowoomba on Thursday night, 11th June, Mr. J. T. Tod, Chairman of the State Wheat Board, died at Toowoomba on the following Monday, without having regained consciousness. Ever the friend and champion of the primary producer, Mr. Tod's passing at the age of 54 is an irreparable loss to the farming community which he so long and faithfully served.

Being a farmer himself no one more fully realised the difficulties with which the man on the land was faced, and with self-sacrificing devotion he set about to try and improve conditions by organised marketing. It will be remembered in this connection that Mr. Tod was a prominent member of the Council of Agriculture when that body was formed.

Born in England of Scottish parentage, the late Mr. Tod came out as a young man to his uncle, Mr. Fred Reid, of Balikera, Maitland district, New South Wales. After undergoing a course of training at Hawkesbury Agricultural College, he selected a block of land on the Goomburra Estate, Darling Downs. There Mr. Tod carried on dairying and wheat-growing, and in both was equally successful. He also secured land at Goondiwindi. Always a lover of high-class dairy stock and a sound judge of quality he did much to assist in the improvement of the dairy herds of his district.

Among his manifold activities he was an energetic and valued member of several marketing boards.

Mr. Tod became a member of the State Wheat Board for the Clifton-Allora district in a by-election in January, 1929, and in August of the same year he was re-elected unopposed. At the usual election in September, 1929, he was elevated to the position of chairman, and was again returned unopposed in September, 1930, when he was reappointed chairman for a period of two years.

Mr. Tod was also closely associated with the manufacturing side of dairying as a director of the Warwick Co-operative Dairy Association, Allora, of which company he was chairman for several terms. He occupied the position of president of the Co-operative Dairy Companies' Association of Queensland for about fifteen years, and was a member of the Australian Stabilisation Committee (Queensland section), and as a delegate from Queensland he frequently took a leading part in important conferences connected with the dairying industry in Australia.

When the Local Producers' Associations were initiated he took a keen interest in their organisation, with the result that prior to the abolition of the district councils he became chairman of the Darling Downs District Council.

The late Mr. Tod married Miss L. Hogarth, third daughter of the late Mr. and Mrs. William Hogarth, of Balgownie. He is survived by his widow, four sons, and three daughters. Mr. Tod was a man of sterling character and outstanding ability, besides being possessed of a great fund of tact and natural courtesy which won him many friends.

Queensland primary producers have lost one of their best friends, and one of their best and soundest advisers as the result of the untimely death of Mr. Tod.

An immense concourse at his interment in the Toowoomba Cemetery on 16th June included representatives of the Government, Department of Agriculture and Stock, and every section of the community.

MR. JOHN JOSEPH FANNING.

The death of Mr. John Joseph Fanning, late business manager of the National Mutual Life Association of Australasia Company, Limited, in Queensland, occurred suddenly at his residence, at Auchenflower, on 14th June. The late Mr. Fanning, who was well known and highly esteemed in the business community of Brisbane, was fifty-seven years of age, and was born at Kingstown, Ireland. He came to Australia with his parents when he was about eight years of age, and they settled at Bowen. As a youth he entered the service of the National Mutual Life Association at Townsville, and travelled extensively in North Queensland on behalf of his company. He was one of the best-known men in Queensland, and for the greater part of his life was closely connected with the horse and cattle industries of the State. He was for a long period the manager for North Queensland of the National Mutual Life Association, coming to Brisbane three years ago as the new business manager of the association. With a popularity that extended all over the State and throughout the Commonwealth, the news of Mr. Fanning's death came as a shock to all those who knew him. For many years he was a judge in the horse section of the Royal National Agricultural and Industrial Association of Queensland, of which he was a member, and had judged at most of the principal shows in Australia. In connection with his business affairs, the late Mr. Fanning had many trips to the East. He was also closely associated with the export of cattle to the East, and of horses to India.

A large and representative gathering of citizens assembled at the graveside to pay a last tribute of respect. He is survived by his widow and ten children, to whom the sympathy of the whole community is extended.

COLD STORAGE OF GRAPES.

THE Minister for Agriculture and Stock, Mr. H. F. Walker, has received the following report on experiments conducted by Mr. Jas. H. Gregory, Instructor in Fruit Packing, in the cold storage of grapes from the Stanthorpe district. The objects of the experiments were to determine—

(1) The suitability of particular varieties for storing and keeping for lengthy periods with a view to perhaps extending the season for marketing locally and exporting.

(2) The length of time possible for safe storing to enable exporting to be a satisfactory proposition.

(3) The best method of packing for commercial use locally and abroad.

The grapes were held in storage for varying periods, and were treated exactly as a grower's consignment would be treated. The main varieties, Waltham Cross, Black Muscats, Gordo Blanco, Red Hanifont, Flame Tokay, Red Malaga, Cervant, Gros Coleman, and Purple Cornichon, were used. One case of each of these varieties was packed in sulphite paper and woodwool. The three-quarter bushel case was used, the bunches being wrapped in the sulphite paper and nested in the woodwool.

Contents of Cases.

The average weight of fruit in this container when packed in paper and woodwool was approximately 15 lb., 1½ lb. of woodwool being required as packing. One case of each variety was also packed in granulated cork, each case containing approximately 25 lb. of fruit, using 1½ kerosene tins of cork to the case. No definite weight can be given of the cork, as, with two different kinds used, a kerosene tin weighed 4 lb. with one lot and only 2½ lb. with the other.

Packing and Storage Period.

The first shipment of grapes was packed at Glen Aplin on 4th March, Black Muscats and Waltham Cross being the varieties, being placed in store on 6th March. Inspections made on the 17th and 30th March showed the fruit to be in excellent condition, but an inspection on 17th April showed only three of the cases to be in good order, the case of Black Muscats packed in sulphite paper and woodwool

showing signs of deterioration. These cases were removed from store on 25th April, after seven weeks storage, and held for three days. At the end of this period the cases packed in cork were in excellent order, and were sold, realising 9s. per case. The Muscats packed with woodwool showed a percentage of waste due to the attack of moulds, whilst the Waltham Gross were in excellent order.

The second shipment of grapes, comprising Gros Coleman and Flame Tokay, was packed on 27th March, being placed in storage on 30th March. The Flame Tokay were sweated for three days. Unfortunately, the Gros Coleman were picked only four days after heavy rain, which necessitated extensive trimming to eliminate ring splitting and cracked berries. These were removed from storage on 30th April, after four weeks, in an unsaleable condition, although the wrapped fruit was in a much better condition than that packed in cork. The case of Flame Tokay packed in woodwool and paper was also removed at this time as it was showing signs of reaching its limit of storing. These were placed on the market, but, owing to the small quantity in the case, it was impossible to find a buyer. The remaining case of Flame Tokay packed in cork was held in storage seven weeks, until 18th May, and was removed in excellent condition, realising 10s. on the open market.

The last consignment of eleven cases, comprising the varieties Gordo Blanco, Cervant, Red Malaga, Red Hanifont, Waltham Cross, and Purple Cornichon, was packed on 31st March, placed in storage on 2nd April, and found in good order when inspected on 8th May. The Purple Cornichon and Waltham Cross were taken from the same consignment as that sent to Canada, and were used as a check on the results of the shipment. These grapes were all removed from the cold stores on 18th May, after being kept for a period of six weeks.

Effectiveness of Different Packing, and Prices Realised.

Gordo Blanco in woodwool wasty and unsaleable; in cork in good order, but realised only 6s. per case on the market. Cervant in woodwool were wasty in the tight bunches, showing about 10 per cent. wastage; in cork in perfect order; but only realised 6s. on the market, which was surprising as their condition was so fine; a good bunch taken from the woodwool pack kept in excellent order for ten days. Red Malaga, packed in woodwool, in good condition, only an occasional berry being at all damaged; in cork the condition of the fruit was excellent, realising 10s. on the market. Red Hanifont in woodwool showed waste, having a tendency to mould around the stalk; approximately 15 per cent. waste. Red Hanifont in cork, a few berries being slightly wasty, realised 10s. on the market. Waltham Cross in woodwool showed a small percentage of waste; the grapes also had a tendency to go bladdery. This was the only variety to develop this fault; the cork packing showed a small percentage of wasty berries, but realised 12s. on the market. Purple Cornichon in woodwool and sulphite paper looked as good as the day they were picked, showing the bloom to perfection, but when sent to the market were not sold owing to the small quantity in the case; in cork the fruit was in good order and realised 12s. per case.

From these results it appears that grapes can be successfully exported from Queensland to most parts of the world. Shipments successfully sent during the season to Canada, New Zealand, and the East give added support to this.

Possible Time for Safe Storage.

It appears from this experiment that the length of time for keeping the different varieties, if carefully trimmed and handled, is as follows:—

Purple Cornichon	Seven to eight weeks.
Flame Tokay	Seven to eight weeks.
Red Malaga	Seven to eight weeks.
Cervant	Seven to eight weeks.
Black Muscats	Five to six weeks.
Waltham Cross	Five to six weeks.
Red Hanifont	Four to five weeks.
Gordo Blanco	Three to four weeks.
Gros Coleman	Three to four weeks.

It would certainly be possible to keep the harder varieties, such as Purple Cornichon, Flame Tokay, and Malaga, for a longer period than eight weeks, but each additional week would increase the chance of waste and would also make it harder to hold the fruit long enough for handling and marketing after the storage process had been stopped.

Commercial Possibilities of Different Methods of Packing.

The results from the two methods of packing were inconclusive as to keeping qualities, the harder type of grape appearing to keep and open in better condition in the woodwool and sulphite paper, whilst the softer varieties kept better in granulated cork. Waltham Cross in cork showed a slight browning of the skin, which was not noticeable in the woodwool pack. From the marketing in Brisbane viewpoint the cork is the only method the buyers appear to want, the woodwool pack being unsaleable. Reports received on the Canadian shipment showed that both types of packing carried well, but it is pointed out that there is not enough fruit in the woodwool package. This would also reflect on shipping charges, as only 15 lb. of fruit would be carried in woodwool for the same price as 25 lb. in cork, shipping freights being on the basis of capacity. The cost of packing a case in cork was approximately 1s. 6d. for cork to pack 25 lb., whilst woodwool and sulphite paper costs 4d. for 15 lb. of fruit. This does not include the cost of the case. Any gain in the cost of packing is offset by the increased cost of extra cases needed. Taking the cost of a case as 1s., it would cost 2s. 6d. for 25 lb. fruit in cork and 1s. 4d. for 15 lb. fruit in woodwool, which would mean every 150 lb. fruit in cork would cost 15s. against 13s. 4d. in woodwool and sulphite paper. As there does not appear to be any gain in price for the better appearance of fruit in woodwool the packing of fruit in cork must still be the accepted method as it means less handling.

Quality of Fruit after Storage.

A feature of the fruit after its removal from storage was the apparent absence of any loss in flavour and eating quality.

Condition of Stalks after Storage.

Observations of the stalk and clinging power of the berries after storage showed different results with some varieties when shaken gently to test the power to hang on the bunch.

Black Muscats.—Stalks brown and dry; a tendency for berries to drop off.

Gordo Blanco.—Stalks brown, and berries loose and falling easily.

Red Hanifont.—Stalks brown, and odd berries falling.

Flame Tokay.—Stalks brown and dry, berries when falling having a short length of stalk attached to the fruit; the stems breaking from the bunch.

Red Malaga.—Stalks brown and dry; keep well attached to the bunch.

Cervant.—Stalks brown and dry, but fruit remains well attached to the bunch.

Waltham Cross.—The main stalks were browned, but the berry stalks were still green; fruit stays on the bunches.

Gros Coleman.—Stalks brown and dry, and berries became easily detached from the bunch.

Purple Cornichon.—Stalks brown; berries hanging well on the bunch, but breaking off easily where attached to the stalk if roughly handled.

As the weather conditions in the Stanthorpe district, owing to the prevalence of storms, were not favourable to the long storage of grapes, the results are very satisfactory.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The Young Farmer.

LESSONS IN PIG RAISING.—I.

(Prepared by the Department of Agriculture and Stock, Brisbane, Queensland.)

THE PIG AS A PORK-PRODUCING MACHINE.

THE pig, in its natural state, is an omnivorous animal found in several countries on jungle and forest land, and obtaining its food in the form of succulent roots and herbage, fruits, insects, and small animal life, and the dead carcasses of large animals. The wild pig frequents shady and swampy areas where it can obtain comfort in hot weather as the peculiar structure of a pig's skin does not allow free perspiration by means of which the bodies of most animals are cooled.

Typical wild pigs are variable in size; are mostly stunted and ill-shaped with coarse gristly forequarters, strong bristly greyish-coloured hair, a very long snout, long, sharp tusks protruding from the mouth, and with a fierce temper. They are voracious, greedy feeders, breaking into crops and stores of food, and become a real nuisance to settlers in newly settled districts. Their immense appetites and slow growth render them quite unprofitable in comparison with domestic pigs. The wild pigs of Australia are not original wild strains, but are the descendents of domestic pigs which have escaped into the scrub and forest and have reverted to a wild type.

The modern domestic pig has been developed during the past century or more from the best of the wild strains available in England, America, China, and Italy, and by careful breeding, feeding, housing, and selection has been brought to a very high standard as regards breeding, appearance, growth, and development. When these improved conditions of breeding, feeding, and management are properly used, we find the pig a very profitable machine for utilising numerous farm products to produce a very saleable product in the form of pig meats such as pork, bacon, and ham.

Wherever improved pigs are kept and are given careful attention, hygienic surroundings, and ample good food, they are profitable animals and useful additions to the farm, but to get the greatest efficiency from the pig as a pork producing machine, it must be the correct type of pig and we must give it the best conditions of food and accommodation, and manage it in such a way that it will not be hindered in its growth by parasites or diseases; then the pig must be marketed to the best advantage, paying attention to the exact requirements of the consumer, and in order to ascertain the degree of efficiency in the business of pork production, exact and full records must be kept of every operation and a summary made.

The aim of each farmer and Pig Club member is to raise one or more pigs to a certain stage of growth and to treat them as pork producing machines, which should be run with the highest possible efficiency, and in order to achieve this objective the pig raiser should study every phase of his work and then apply his knowledge to his project so that he will benefit financially from the project, and so that he will be a wiser pig raiser and a more useful citizen when he has finished his job. Later lessons treat with some detail the factors which influence the success of the pig-raising business, and their careful study is earnestly recommended. Note that many useful and informative pamphlets may be obtained from the Department of Agriculture and Stock, Brisbane. Write for some of this literature.

Questions.

(1) In what countries were wild pigs common, and what were the food those pigs ate?

(2) How were domestic pigs developed and brought up to their high standard?

(3) Why are pigs kept on our farms, and why should they be given careful attention?

(4) Where can you obtain further information on the business of pig raising?

GESTATION CHART FOR BREEDING SOWS.

Jan.	Date of Farrowing	Feb.	Date of Farrowing.	March.	Date of Farrowing.	April.	Date of Farrowing.	May.	Date of Farrowing.	June.	Date of Farrowing.	July.	Date of Farrowing	Aug.	Date of Farrowing.	Sept.	Date of Farrowing	Oct.	Date of Farrowing	Nov.	Date of Farrowing.	Dec.	Date of Farrowing.
1	22 April	1	23 May	1	20 June	1	21 July	1	20 Aug.	1	20 Sept.	1	20 Oct.	1	20 Nov.	1	21 Dec.	1	20 Jan.	1	20 Feb.	1	22 Mar.
2	23 ,,	2	24 ,,	2	21 ,,	2	22 ,,	2	21 ,,	2	21 ,,	2	21 ,,	2	21 ,,	2	22 ,,	2	21 ,,	2	21 ,,	2	23 ,,
3	24 ,,	3	25 ,,	3	22 ,,	3	23 ,,	3	22 ,,	3	22 ,,	3	22 ,,	3	22 ,,	3	23 ,,	3	22 ,,	3	22 ,,	3	24 ,,
4	25 ,,	4	26 ,,	4	23 ,,	4	24 ,,	4	23 ,,	4	23 ,,	4	23 ,,	4	23 ,,	4	24 ,,	4	23 ,,	4	23 ,,	4	25 ,,
5	26 ,,	5	27 ,,	5	24 ,,	5	25 ,,	5	24 ,,	5	24 ,,	5	24 ,,	5	24 ,,	5	25 ,,	5	24 ,,	5	24 ,,	5	26 ,,
6	27 ,,	6	28 ,,	6	25 ,,	6	26 ,,	6	25 ,,	6	25 ,,	6	25 ,,	6	25 ,,	6	26 ,,	6	25 ,,	6	25 ,,	6	27 ,,
7	28 ,,	7	29 ,,	7	26 ,,	7	27 ,,	7	26 ,,	7	26 ,,	7	26 ,,	7	26 ,,	7	27 ,,	7	26 ,,	7	26 ,,	7	28 ,,
8	29 ,,	8	30 ,,	8	27 ,,	8	28 ,,	8	27 ,,	8	27 ,,	8	27 ,,	8	27 ,,	8	28 ,,	8	27 ,,	8	27 ,,	8	29 ,,
9	30 ,,	9	31 ,,	9	28 ,,	9	29 ,,	9	28 ,,	9	28 ,,	9	28 ,,	9	28 ,,	9	29 ,,	9	28 ,,	9	28 ,,	9	30 ,,
10	1 May	10	1 June	10	29 ,,	10	30 ,,	10	29 ,,	10	29 ,,	10	29 ,,	10	29 ,,	10	30 ,,	10	29 ,,	10	1 Mar.	10	31 ,,
11	2 ,,	11	2 ,,	11	30 ,,	11	31 ,,	11	30 ,,	11	30 ,,	11	30 ,,	11	30 ,,	11	31 ,,	11	30 ,,	11	2 ,,	11	1 April
12	3 ,,	12	3 ,,	12	1 July	12	1 Aug.	12	31 ,,	12	1 Oct.	12	31 ,,	12	1 Dec.	12	1 Jan.	12	31 ,,	12	3 ,,	12	2 ,,
13	4 ,,	13	4 ,,	13	2 ,,	13	2 ,,	13	1 Sept.	13	2 ,,	13	1 Nov.	13	2 ,,	13	2 ,,	13	1 Feb.	13	4 ,,	13	3 ,,
14	5 ,,	14	5 ,,	14	3 ,,	14	3 ,,	14	2 ,,	14	3 ,,	14	2 ,,	14	3 ,,	14	3 ,,	14	2 ,,	14	5 ,,	14	4 ,,
15	6 ,,	15	6 ,,	15	4 ,,	15	4 ,,	15	3 ,,	15	4 ,,	15	3 ,,	15	4 ,,	15	4 ,,	15	3 ,,	15	6 ,,	15	5 ,,
16	7 ,,	16	7 ,,	16	5 ,,	16	5 ,,	16	4 ,,	16	5 ,,	16	4 ,,	16	5 ,,	16	5 ,,	16	4 ,,	16	7 ,,	16	6 ,,
17	8 ,,	17	8 ,,	17	6 ,,	17	6 ,,	17	5 ,,	17	6 ,,	17	5 ,,	17	6 ,,	17	6 ,,	17	5 ,,	17	8 ,,	17	7 ,,
18	9 ,,	18	9 ,,	18	7 ,,	18	7 ,,	18	6 ,,	18	7 ,,	18	6 ,,	18	7 ,,	18	7 ,,	18	6 ,,	18	9 ,,	18	8 ,,
19	10 ,,	19	10 ,,	19	8 ,,	19	8 ,,	19	7 ,,	19	8 ,,	19	7 ,,	19	8 ,,	19	8 ,,	19	7 ,,	19	10 ,,	19	9 ,,
20	11 ,,	20	11 ,,	20	9 ,,	20	9 ,,	20	8 ,,	20	9 ,,	20	8 ,,	20	9 ,,	20	9 ,,	20	8 ,,	20	11 ,,	20	10 ,,
21	12 ,,	21	12 ,,	21	10 ,,	21	10 ,,	21	9 ,,	21	10 ,,	21	9 ,,	21	10 ,,	21	10 ,,	21	9 ,,	21	12 ,,	21	11 ,,
22	13 ,,	22	13 ,,	22	11 ,,	22	11 ,,	22	10 ,,	22	11 ,,	22	10 ,,	22	11 ,,	22	11 ,,	22	10 ,,	22	13 ,,	22	12 ,,
23	14 ,,	23	14 ,,	23	12 ,,	23	12 ,,	23	11 ,,	23	12 ,,	23	11 ,,	23	12 ,,	23	12 ,,	23	11 ,,	23	14 ,,	23	13 ,,
24	15 ,,	24	15 ,,	24	13 ,,	24	13 ,,	24	12 ,,	24	13 ,,	24	12 ,,	24	13 ,,	24	13 ,,	24	12 ,,	24	15 ,,	24	14 ,,
25	16 ,,	25	16 ,,	25	14 ,,	25	14 ,,	25	13 ,,	25	14 ,,	25	13 ,,	25	14 ,,	25	14 ,,	25	13 ,,	25	16 ,,	25	15 ,,
26	17 ,,	26	17 ,,	26	15 ,,	26	15 ,,	26	14 ,,	26	15 ,,	26	14 ,,	26	15 ,,	26	15 ,,	26	14 ,,	26	17 ,,	26	16 ,,
27	18 ,,	27	18 ,,	27	16 ,,	27	16 ,,	27	15 ,,	27	16 ,,	27	15 ,,	27	16 ,,	27	16 ,,	27	15 ,,	27	18 ,,	27	17 ,,
28	19 ,,	28	19 ,,	28	17 ,,	28	17 ,,	28	16 ,,	28	17 ,,	28	16 ,,	28	17 ,,	28	17 ,,	28	16 ,,	28	19 ,,	28	18 ,,
29	20 ,,	—	—	29	18 ,,	29	18 ,,	29	17 ,,	29	18 ,,	29	17 ,,	29	18 ,,	29	18 ,,	29	17 ,,	29	20 ,,	29	19 ,,
30	21 ,,	—	—	30	19 ,,	30	19 ,,	30	18 ,,	30	19 ,,	30	18 ,,	30	19 ,,	30	19 ,,	30	18 ,,	30	21 ,,	30	20 ,,
31	22 ,,	—	—	31	20 ,,	—	—	31	19 ,,	—	—	31	19 ,,	31	20 ,,	—	—	31	19 ,,	31	22 ,,	31	21 ,,

NOTE.—Black figures in above table indicate date of service.

This chart presents in an instructive form figures relating to the gestation period of brood sows. For example, a sow mated to the boar on 1st January is due to farrow on 22nd April; a sow mated on 1st July is due on 20th October. The chart should be preserved for future reference by breeders of all classes of pigs. The normal period of gestation, *i.e.*, the period from the time of conception to the birth of the young pigs, is 112 days, this period is sometimes remembered as roughly three months three weeks three days, or 16 weeks. With very young sows the period is sometimes of shorter duration, and instances are on record where young sows have farrowed at from 100 to 108 days after becoming pregnant; on the other hand, old sows in abnormal condition have been known to carry their young for more than 140 days.—E. J. SHELTON, H.D.A., *Senior Instructor in Pig Raising.*

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Variegated Thistle.

F.A.C. (Brisbane)—

Variegated Thistle, *Silybum Marianum.*—This plant is very common in parts of the Darling Downs and New South Wales. Generally speaking we seem to have little trouble with it in Queensland, but below the Border it has been reported to have caused death among stock, particularly cattle, on several occasions. The symptoms given seem to be those of prussic acid poisoning; that is, the stock generally die suddenly and no outstanding symptoms are ever shown. Post-mortem examination also reveals nothing diagnostic. Mr. Max Henry, New South Wales Government Veterinary Surgeon, has reported that in some cases a distinctly inflamed condition of the stomach and intestine is evident. Analysis, however, as carried out by chemists both here and in the Southern States, has so far failed to detect with certainty the presence of a prussic-acid-yielding glucoside. Paddock stock, as a general rule, do not seem to be greatly troubled, most of the losses occurring with travelling animals.

Tea-Tree Oil.

E.C. (Biggenden)—

Your specimens of leaves of the Tea-tree from Degilbo Creek were handed to Dr. Jones at the University, who is making a study of the essential oil from Queensland plants. He states that the oil, so far as can be judged from the small specimens obtained, showed no differences from that of the River Tea-tree, *Melaleuca bracteata.*

Giant Couch.

H.C.B. (Coolum, Yandina)—

The specimen of grass is *Brachiaria mutica,* more commonly known in Queensland as *Panicum muticum* or Giant Couch. This grass is very extensively planted in parts of Queensland from Rockhampton northwards, but is less common in the more southern parts of the State. In some parts of North Queensland, such as the Daintree River and the moister and more tropical parts of the Atherton Tableland, it is the principal dairy grass relished by stock, and with a very high reputation as a fodder. We should say it is one of the best grasses you could plant on your particular class of country.

Hairy Indigo.

P.K. (Yandina)—

Your specimen is Hairy Indigo, *Indigofera hirsuta,* a weed very common in coastal Queensland and not known to possess any harmful properties. It has been reported as a useful forage though we cannot say that we have ever seen stock eat it, or at least not to any extent.

Sorghums.

O.L.H. (Atherton)—

It is rather hard to tell species of sorghum from seed-heads alone, the chief difference being in the root system, but we have little doubt that the one you send is *Sorghum laxiflorum,* a native of Africa now naturalised, and very abundant in coastal Queensland. *Sorghum laxiflorum, Sorghum sudanense,* the Sudan Grass, and *Sorghum halepense,* Johnson Grass, are very similar in general appearance, but can be immediately distinguished one from the other by their peculiar root systems. *Sorghum laxiflorum* is a large perennial species forming a compact root base with numerous buds coming up therefrom. *Sorghum sudanense* is typically an annual species though biennial strains have, of course, been developed. Johnson Grass is immediately distinguished by the possession of long white underground runners.

Trees on Macpherson Range. Books on Forestry.

J.K. (Macpherson Range)—The specimens represent—

(1) *Guilfoylia monostylis.* A small tree moderately common in the MacPherson Range scrubs of south-eastern Queensland. I have never seen it reach a large size, and I do not know that the wood has any commercial value. It is sometimes known as *Cadellia monostylis,* but the former is preferable.

(2) Leaflet only, but I should say is *Euroschinus falcatus,* a tree known by various local names in Queensland, including Donnelly's Cedar (the one you give it) and Ribbon Wood. The wood warps very badly, though I think it has been cut in Queensland to a limited extent.

In reply to your queries regarding books on forest trees, "Elementary Text-book of Australian Forest Botany" (by C. T. White, F.L.S.) would hardly enable you to identify the trees growing in your scrubs as it is purely a text-book and deals with the correct use of botanical terms and so forth. It was primarily prepared for use by students of the Australian Forestry School. The best book for you to get would be "Australian Rain-forest Trees," by W. D. Francis. This is profusely illustrated, and we think you would find practically all the scrub trees of your locality in it. The price is 10s. 6d., plus postage. It is published by the Council for Scientific and Industrial Research, but is obtainable through any bookseller. Barker's Book Stores, Brisbane, have copies.

Cotton Industry.

"INTERESTED" (Brisbane)—

(1) The cotton-growing areas of Queensland, generally speaking, lie along the slopes, and medium alluvial loamy flats of the valleys of the eastern watershed of the Great Dividing Range from north of Beaudesert in the South to the Fitzroy River and areas adjacent in the North, and lying behind the coastal ranges from Brisbane to Gladstone, and thence north to Rockhampton. This covers an area of some 400 miles long by 50 to 150 miles wide. In this area the following cotton districts are included:—Lockyer, Brisbane Valley, South, Central, and Upper Burnett, and the Central district, including Dawson Valley, Callide Valley, and areas around Rockhampton.

(2) The Commonwealth Government is giving a bounty on seed cotton, per lb., on a graduated scale as follows:—1931, 1½d. per lb. seed cotton; 1932, 1¼d.; 1933, 1d.; 1934, ¾d.; 1935, ½d.; 1936, ¼d.

Prices of Buttermilk.

Replying to an inquiry recently on the approximate value at the rate of 1,000 gallons for buttermilk from butter factories, mention was made of the fact that there is no standard value for the product named or for whey or skim milk, as everything depends upon local conditions of supply and delivery. We know of one case in which the purchaser pays 11s. per 1,000, and secured 1,200 gallons for every 1,000 paid for, but has to cart the milk 2 miles in tanks on a horse-drawn vehicle. Another purchaser pays 16s. per 1,000 gallons, and has milk pumped direct to tanks at his piggeries. His supply is based on 300 gallons of buttermilk to every ton of butter manufactured. Other purchasers pay 20s. per 1,000 gallons, and have the milk delivered, and have as part of their contract to dispose of the waste water from the factory. Probably about 15s. per 1,000 gallons would be a satisfactory price to pay where the milk was delivered per pipe line on to the property.

Journal Subscriptions.

A Correspondent (Gunnewin, via Roma)—

Your subscription—postal note for 1s.—has been received, but your covering letter is unsigned. Please send full name.

A Correspondent (Wooroolin)—

A postal note for 2s. has been received, but no name and address was attached to the covering letter. Please rectify the omission as soon as possible to enable us to place your name on our mailing list.

General Notes.

Queensland's Royal Show

The offices of the Royal National Association, Courier Building, Brisbane, are now the scene of considerable activity in connection with the forthcoming Royal National Show, to be held at Bowen Park, from 10th to 15th August. Exhibitors in all sections are strongly urged to lodge their entries at once and thereby avoid the personal inconvenience of the usual last moment rush.

For the benefit of those who cannot conveniently call during ordinary business hours the offices of the Association will remain open for the lodgment of entries for the dog and poultry sections until 8.30 p.m. on Friday and Monday nights, 3rd and 6th July, respectively.

Entries in all main sections of the Show, including horses and cattle, positively close on Monday, 6th July.

There is still time to write or telephone for copy of the Prize Schedule. Send your entries along and help to break new records at the 1931 Royal National Show.

Staff Changes and Appointments.

Mr. William Freeman, of Bribie Island, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Messrs. H. Lambert, H. J. Rollston, and J. Macfie have been appointed Assistant Inspecting Cane Testers for the forthcoming sugar season, with headquarters at Cairns, Mackay, and Bundaberg, respectively.

The following have been appointed Cane Testers for the forthcoming sugar season at the mills mentioned in each case:—Miss. J. O'Flynn (Babinda), Mr. L. Chadwick (Cattle Creek), Miss J. Orr (Farleigh), Mr. T. Herbert (Gin Gin), Mr. V. F. Worthington (Inkerman), Miss E. Christsen (Invicta), Mr. T. F. Brown (Kalamia), Mr. W. J. Mason (Marian), Mr. P. H. Compton (Maryborough), Mr. L. G. F. Holbach (Mossman), Mr. W. Ahern (Mourilyan), Mr. T. V. Breen (Mulgrave), Mr. F. C. J. Jorss (Pioneer), Mr. L. C. Home (Plane Creek), Mr. W. J. Richardson (Proserpine), Mr. H. Jensen (South Johnstone), and Miss H. T. Smith (Tully).

The following have been appointed Assistant Cane Testers for the forthcoming sugar season at the mills mentioned in each case:—Miss D. Bowder (Inkerman), Mr. T. F. Corbett (Babinda), Mr. St. C. G. Fanning (Pioneer), Mr. C. H. Humphreys (Kalamia), Miss C. Humphreys (Proserpine), Miss C. Knight (Racecourse), Miss M. A. Syle (Tully), Miss A. Mullin (Plane Creek), Miss E. Mullin (Bingera), Miss A. Murray (Farleigh), Mrs. M. Nally (Maryborough), Miss M. Orr (Moreton), Miss T. Payne (Marian), Miss H. Rowe (Millaquin), Mr. G. Tait (Marian), Mr. D. Walton (Plane Creek), Mr. H. T. Whitcher (Pleystowe), Miss M. C. Whittle (Pleystowe), Miss M. A. Morris (Invicta).

The following have been appointed Cane Testers for the forthcoming sugar season at the mills mentioned in each case:—Mrs. K. Dunton (Bingera), Miss A. B. Levy (Fairymead), Miss D. Maries (Isis), Mr. F. W. Trulson (Marian), Mr. H. C. Jorgensen (Millaquin), Mr. C. J. Boast (Moreton), Mr. T. D. Cullen (North Eton), Miss I. Palmer (Pleystowe), Miss N. Walsh (Qunaba), Mr. J. C. D. Casey (Racecourse), Mr. J. Howard (Rocky Point), Mr. G. Tait (Mount Bauple).

Miss M. Orr, Assistant Cane Tester, has been transferred from Moreton to Marian Mill, and Miss V. Page has been appointed Assistant Cane Tester at Moreton Mill for the forthcoming sugar season.

The resignation of Mr. W. J. Mason as Cane Tester at Marian Mill has been accepted.

A Stock Question.

In a case recently heard in the Supreme Court, Brisbane, the question was raised as to which was the "off" and which the "near" side of cattle. Under the Brands Act these terms are defined clearly. The "off" side is the right-hand side of the animal and the "near" side is the left-hand side. This applies to horses, cattle, sheep, swine, camels, and goats. Therefore, a horse is mounted from the "near" or left-hand side, and cows generally are milked on the "off" or right-hand side.

Northern Sanctuaries.

The Deputy Governor, acting for and on behalf of His Excellency the Governor, in Council, has approved of the issue of an Order in Council declaring Salton Lake Paddock, Reedy Brook Holding, Ingham, the property of Mr. James H. Anyon, a sanctuary under the Animals and Birds Acts, in which it shall be unlawful for any person to take or kill any animal or bird.

State Wheat Board Election, District No. 4.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, Brisbane, until noon on the 18th July, 1931, for election as representative of wheat growers of District No. 4 for appointment to the State Wheat Board until the 31st August, 1932. Each nomination is to be signed by at least ten wheat-growers who delivered to the Board wheat harvested during any of the 1927-28, 1928-29, or 1929-30 seasons, who reside in the old (1921) Cunningham electorate (with the exception of the Warwick and Killarney Divisions).

The representative shall be a grower of wheat who delivered to the Board wheat harvested during any of the above seasons.

Fruit and Vegetables Act.

Up to the present, the Fruit and Vegetables Act has applied to apples, apricots, bananas, cherries, currants, custard apples, figs, gooseberries, cape gooseberries, grapes, grape fruit, loquats, lemons, mangoes, nectarines, oranges, passion-fruit, peaches, pears, persimmons, pineapples, plums, quinces, or tomatoes as fruits. The Deputy Governor in Council has now declared strawberries also to be fruit for the purposes of the Act, and, in future, the provisions of the Act will apply to strawberries as well as the abovementioned fruits.

The Deputy Governor (Hon. Sir James Blair, C.J.), acting for His Excellency the Governor, has approved of the issue of a Regulation under "*The Fruit and Vegetables Act of* 1927" prescribing the method of packing strawberries. The Regulation provides that when strawberries are marketed in punnets, the name and address of the packer must be marked legibly and durably on both the top side and the end of the bottom half of the punnet in block letters of not less than three-sixteenths of an inch in height. Penalties for a breach of this Regulation are £2 for a first offence, and not less than £2 nor more than £20 for a second or subsequent offence.

Dry Farming.

Mr. W. J. Mearns, an old subscriber, writes:—Cultivation is the science which is necessary for the advancement of all the conditions under which we live. Our minds require cultivation so that we may be able to understand the very complex conditions of modern life. Before we are able to put forth a supreme effort to excel in feats of bodily strength we must undergo a process of physical culture. Man's knowledge of the fundamental laws which govern nature qualifies him to make conditions suitable to get the best results. The law which governs nature is immutable. Man's efforts can strain her conditions, but left to herself Nature will soon revert to the primary conditions which govern her. What we want to deal with is land culture in its different phases. Dry farming, in my opinion, is the most efficient method by which Mother Earth can be made to yield to us her best results. The soil contains all the elements necessary for plant life, the wonderful chemical changes which take place by the breaking-up of organic and inorganic elements by the action of gases which are dissolved and distributed by water in the form of rain are well known. The results of dry farming are most evident when the system is applied to soil washed down from higher altitudes, and that makes up our river flats. On such soil the capillary system is most apparent. That system is really a network of hollow rods that reach far down into the subsoil and by which moisture and plant food are brought from the lower depths to the surface. This system operates from the bottom upward, and the roots of plants tap those "arteries" which contain the elements of their life. To prevent loss of moisture the surface should be kept cultivated to a depth of 2 to 3 inches. This action breaks the tops of the rods thereby preventing loss. The longer and oftener this work is continued the better, especially during prolonged dry spells. By thorough and constant surface cultivation good crops may be produced even in periods of scanty rainfall. That has been my own experience in many years of farming with, I may justly claim, substantial success.

Comparative Feeding Values.

Hay, silage, and mangels are all characterised by much variation in their respective feeding values, and thus any exact statement of the comparative value of the three feeds is not feasible. Chemical analysis as a means of ascertaining the relative feeding values is quite insufficient, because of the operation of such factors as palatability, which are not indicated by analysis. As a result of live stock feeding trials, Amos, of Cambridge, states that 1 lb. of 25 per cent. silage equals 2 lb. of roots, and 1 lb. of hay equals 3 lb. of silage. Results obtained by Rae in Hertfordshire, Sheehy at Athenry, and Drew at Glasnevin, in a general way confirm the figures given by Amos. Advice has been received from many reliable sources that stock thrive exceptionally well on silage. So persistently has this been reported that one is forced to the conclusion that silage has some specially valuable feeding quality or qualities, the nature of which is not yet fully understood.—Fields Division, New Zealand Department of Agriculture.

Fruit Marketing—The C.O.D.

The Governor in Council has to-day approved of the issue of Regulations under "*The Fruit Marketing Organisation Acts*, 1923 *to* 1930," amending various regulations now existing under such Acts.

Certain of the amendments provide for the tenure of office of the Committee of Direction and the various Sectional Group Committees to be extended to two years in lieu of one as previously. This move is made from the point of view of economy, and it is also considered that it will result in a continuity of policy being preserved.

Other amendments merely clarify the procedure in respect to the holding of elections for the Sectional Group Committees and correct certain anomalies which now exist.

Power is also given to the Sectional Group Committees to recall their representative or representatives on the Committee of Direction, if necessary. Provision is made for the voting power of a member on the Committee of Direction when only one representative has been elected by a Sectional Group Committee, or when in the instance of two representatives of a Sectional Group Committee one only of such representatives is present at any meeting of the Committee of Direction.

The Royal Society of Queensland.

The Ordinary Monthly Meeting of the Royal Society was held in the Geology Lecture Theatre of the University on Monday, 25th May. The President, Dr. D. A. Herbert, was in the chair. Miss E. Duncan, B.Sc., Dr. J. G. Drew, and Mr. N. Fisher, B.Sc., were elected unanimously to membership.

Dr. Lockhart Gibson exhibited the inflorescence of a papaw plant, which had been cut back in youth. The inflorescence also bore young fruit. In addition to male and female flowers, the plant bore flowers, exhibiting stages intermediate between the male and females. It is sometimes claimed that male plants of this species can be converted into females by cutting back before the flowering period. The exhibitor remarked upon the occurrence of hermaphroditism in human beings. The President, Mr. Bick, Dr. E. O. Marks, and Mr. W. H. Parker, a visitor, commented upon the exhibit.

Dr. T. G. H. Jones read a paper by himself and Mr. M. White, M.Sc., entitled "Essential Oils from the Queensland Flora: *Agonis Luehmanni* Bailey."

Agonis Luehmanni is known only to occur on the tops of some of the Glass House Mountains. The yield of oil was .25 per cent. Constituents of the oil proved to be principally pinene 60 per cent., ocimene, aromadendrene, sesquiterpene alcohol, and a small amount of a crystalline yellow solid. The result is in contrast with that from *Agonis abnormis*, the oil of which consists primarily of sesquiterpenes.

Dr. T. G. H. Jones gave a short lecture on "Essential Oils." The lecture dealt with the general properties of essential oils and the methods of extracting them. The primary method was that of distillation in steam, but for perfumery extraction with suitable solvents was frequently resorted to. This yielded better perfumes. The steps necessary in the general examination of essential oils were then discussed, particularly the determination of important physical and chemical constants. Reference was then made to the essential oils from Australian plants, particularly those from the eucalypts. The theory of Smith and Baker, connecting leaf venation and chemical constituents, and the possible evolution of the eucalypts was finally dealt with.

The President, Mr. Bennett, Dr. E. O. Marks, Mr. Francis, and Dr. Lockhart Gibson took part in the discussion which ensued.

A Lesson from California.

By initiating a personal movement to use more wool members of California Woolgrowers' Association have set an example to producers in other parts of the world. The slogan adopted at the last annual convention was "Make this a Wool Christmas," and one of the ways in which it was carried out was by local associations having special blankets manufactured and distributed to members at slightly above cost. By this means the consumption of wool was materially increased.

Banana Marketing.

The Governor in Council has to-day approved of the issue of an Order in Council declaring that all bananas produced in Queensland during the period from the 6th June, 1931, to the 31st December, 1934, shall be acquired by the Committee of Direction of Fruit Marketing, as the owners thereof.

A Regulation was issued recently empowering the Committee of Direction to take a ballot of all banana-growers in the State to decide whether or not the whole of the bananas produced in Queensland until the 31st December, 1934, should be so acquired by the Committee of Direction. The ballot closed on Monday, 1st June last, 61 per cent. of the votes polled being in favour of the acquisition by the Committee of Direction.

Early Importations of Jersey Cattle.

In the course of a recent conversation, Mr. James Sargent, of Jandowae (who came originally from Tasmania) stated that in the year 1872 or 1873 an article appeared in an issue of the Hobart "Mercury" in which reference was made to the first introduction of Jersey cattle into Australia. These cattle came direct from Jersey Island, stated Mr. Sargent, the importer being a Mr. Hopkins, a very wealthy man who built a large vessel named the "Nautilus" in which he sailed round the world and brought back to Tasmania from Jersey Island the cattle referred to. Following these initial introductions stock were sold to mainland buyers, and thus they were introduced here and were shown at Royal Shows both in Tasmania and on the mainland. The shipments naturally created great interest. Mr. Sargent, who was then seventeen years old (he is now seventy-six years old) remembers distinctly the references being to the fact that the importations of 1872 were the first of the Jersey breed to enter Australia. He thinks the Hobart "Mercury" would be able to hunt up from its original records the details of breeding and other particulars of the cattle. He referred to a publication entitled "Jersey Cattle in Australia" as giving much information re these early importations.

Australian Apples in England.

It is very gratifying, said Mr. Parker Moloney, Commonwealth Minister for Markets, recently, to learn that Australia has carried off by far the greater number of prizes in the apple classes at the spring section of the Imperial Fruit Show. Indeed, the name of every exporting State which submitted entries appears in the schedule of prize winners. Although, said the Minister, the Press cables refer to the limited number of entries from the Southern Hemisphere, Australia this year considerably increased her representation in that thirty-three entries participated against twelve of last year.

This spring show was inaugurated in 1930 so as to make special provision to meet circumstances surrounding the seasonal production of fruit in the Southern Hemisphere, at the time of the year which is the direct opposite to the producing countries in the Northern Hemisphere. The range of classes in the show this year was considerably enlarged, there being last year only two classes in the overseas section—viz., one for five cases of dessert and another for five cases of culinary apples. This year separate classes are provided for some of the principal export varieties from Australia, New Zealand, and South Africa. The two classes for dessert and culinary apples were included this year, and the entries judged will eventually be compared with the English and Canadian entries at the Annual Imperial Fruit Show held in the autumn. In these particular classes the first prize is £50, the second £30, and third £10. In addition to the cash prizes in the other classes special prizes are offered by some of the main fruit-importing firms in the United Kingdom.

"I compliment those growers," said the Minister, "who have not only been so interested to take special care and trouble to see that Australia was adequately represented at this show, but who also have upheld our best traditions by winning so many prizes in the various sections."

The Pig Without a Tail.

A pig without a tail or with no more than a stumpy apology for that decorative finish to its anatomy is a depressing sight. Actually it ought not to make much difference to the animal itself or to its value whether it has a good or a bad one, or no tail at all, but the fact remains that it does. That at least is the case with pedigree pigs, where appearance counts for a good deal. But it may be said, perhaps, that there is an especial value in the pig's tail in that it indicates the physical and mental condition of the animal to which it belongs. If a pig has no tail you cannot tell so easily whether the owner of it is a happy pig or the reverse, and contentment of mind and body is a very important matter where pigs are concerned. If a pig droops its tail, allowing it to hang limply, you know at once that it is not happy; if, on the other hand, it carries its tail gaily in a nice curly fashion you know that all is well. Little pigs often lose their tails in cold weather through bad circulation caused by wet and cold. If their tails become dirty and draggled they may drop off. Even a strictly commercial pig looks better with a tail than without one. Let us take care, then, that its appearance is not marred by losing this ornament. A little oil rubbed on the tails of small pigs from time to time during the first few weeks of their existence will prevent dirt from adhering, and will encourage circulation to the very tip. Keep your little pigs dry and warm and their tails oiled, and you need have little fear that any caudal calamity will happen to them.—"Live Stock Journal."

Pigs and Sunlight.

In recent years no farm animal has received greater attention than the pig. Much has been done in the direction of improving our various breeds and types, methods of feeding have been closely studied, and experiments without number have been made in regard to different systems of general treatment. Yet in spite of all this there still appears to be room for further improvement in the all-important matter of the pig's dwelling.

The first axiom in pig-keeping is that if pigs are to do well, and to pay their way, they must be housed under comfortable conditions. Judging, however, by what one still sees in every part of the country, it seems to be evident that the importance of housing the pig under the best possible conditions is still a long way from being universally recognised.

The general idea still appears to be that almost any sort of sty will do for a pig—any place, however damp, dark or draughty, is good enough. Even where sties have been well built, with sound walls, roofs and floors, and with a due regard to avoiding the more common causes of discomfort, there is often room for improvement. The very best and most comfortable of sties almost invariably fail in one particular—the admission of sunlight.

To the pig—especially to the young pig—the health-giving rays of the sun are of the greatest possible importance. Pigs are sun-loving animals, and it is only on rare occasions during the summer that they can have too much of the sun. In winter, whether the sun is actually shining or not, every ray of light is valuable.

The Limitations of Drugs.

"Of all the genuine methods which have as their object the prevention of disease," states a New South Wales departmental publication, "the administration of drugs is, widely speaking, of least value." Yet perhaps most stockowners incline to this form of health insurance, and in many cases there is a credulity which is responsible for much waste of money and possibly loss of stock.

"Some little while ago attention was drawn to the excessive claims which are made on behalf of particular remedies for stock diseases," observes the Chief Veterinary Surgeon of the New South Wales Department of Agriculture in a current report. "A very good instance has been recently noted in which a drug was claimed to possess the power to destroy all parasites and all germs in an animal. It is difficult to understand why such claims as this are made when it is realised how difficult it is to obtain a drug that will effectively destroy any germ in the body, and that there is a great deal of difference in the efficiency of any particular drug against any two parasites. It would be thought that more moderate statements would carry greater weight with thinking men. Take for instance, cancer in cattle. There is no known drug which when administered by the mouth will cure cancer, and yet one sees claims made for drugs that they will cure any disease in cattle, and apparently stockowners are impressed by such claims."

Drugs play their part in the control of disease, but the basis of health in stock is good feeding and proper housing and management.

Slaughter of Calves.

Whilst the Licensing of Bulls Bill (Imperial Parliament) was being discussed recently by the Northallerton (England) Farmers' Union, the chairman, Mr. R. Bosomworth, made a striking indictment of dairymen. He argued that it would be much better than passing this Bill to prohibit the slaughter of calves until they weighed 200 lb. It was scandalous that a few-days-old calves should be slaughtered, and he pointed out that the principal offenders in this respect were the milk producers. It was nearly as bad as the Chicago scandal, where it was found that tinned chicken was really calves that had never lived.

Manuring Land.

Organic manure is by no means plentiful, hence the need for putting available supplies to the best possible use. On heavy land horse manure is the most valuable, because it improves drainage by breaking up the soil particles, while cow manure is best for light land because it contains and conserves moisture. Sheep and pig manure is also valuable, but is colder and more concentrated, and for this reason is not applied in such large quantities. Whether light or heavy land, however, never turn down a load of manure because it does not happen to be the correct sort. The addition of some vegetable refuse will help to supply humus, or sowing and digging in a green crop will be valuable. The manure should be applied and dug in when obtained if the land is vacant. If there is a crop on it the manure can be spread between the rows, or it will have to be stacked till required. As a general rule the best way is to apply the manure as obtained, never mind whether fresh or not. Any rain that falls washes the manurial part into the soil and is not wasted, as is often the case when it is stacked. Some time must elapse after the manure is added to the soil before it becomes available as plant food, and for this reason it is best dug in during winter and the ground allowed to lie until spring before the crop is planted. In small gardens, however, it is a case of manure, dig, and crop with little or no waiting period. In such cases, if the manure is applied as a top-dressing to a crop when about half-grown it will become partly decomposed when the time comes for digging, and when dug into the soil will not lay so light and puffy as if fresh. When using fresh manure as a topdressing amongst crops, it is advisable to scatter a little powdered napthalene and salt, in the proportions of four of salt to one of napthalene, on the manure to prevent it becoming a breeding-place for slugs.—"New Zealand Farmer."

Winter Digging.

To get the most out of the soil it is essential that it should be well worked. During the spring and summer the time is taken up with planting and hoeing, and the digging gets missed. The best time to work the ground is during winter. The weather is cooler and the soil moist, consequently the work is not so laborious, and, in addition, the rains cause the soil to settle down and consolidate before the time comes for seeding or planting. If digging the plot ordinarily, take out a trench one spit deep, and wheel the soil to the far end of the plot. Throw the top spit of the second into the first trench and so proceed across the plot. Keep the trench open while digging and thrust the spade blade downwards to its full length in doing the work. It is little use turning up the plot merely 4 or 5 inches deep. Throw up the clods as roughly as possible, leaving the action of frost, sun, air, and rain to break them up during the winter. Do not bury such weeds as docks, bird-weed, thistles, and couch grass. Gather them up into an old tin whilst digging and burn them as soon as they are dry. If they are thrown on top of upturned soil they will not die, and often will live and thrive again. If the plot is to be trenched, stretch the garden line across the plot, marking out a space 2 or 3 feet wide. Take out the soil a spit deep and wheel to the other end for filling in the last trench. Break up the subsoil in the bottom of the trench with a fork or pick-axe, adding plenty of strawy manure or decaying vegetable matter to lighten the soil, forking it well in. Mark out with the garden line another width, as before, and throw the top spit of soil into the first trench. Then break up the subsoil, adding manure, &c., and proceed across the plot, leaving the top layer as rough as possible to let the frost penetrate the soil to destroy insect pests. Do not tramp about on a heavy clay soil any more than can be helped, especially if it is wet. It greatly improves the plot to give lime at the rate of 20 lb. to 28 lb. per rod. Apply the lime as evenly as possible, break up any unbroken clods, and fork the lime well in, leaving the land afterwards until the crops are ready for sowing in the spring. If trenching might take more time than can be spared, throw the plot into ridges, leaving them rough for the winter. If an artificial manure is needed for digging in with winter digging, basic slag, 4 oz. per square yard, is one of the best for producing good results on next season's crop.

Cow with a Wooden Leg.

Miss Margaret Penrose, a New South Wales country woman, has a wooden-legged Jersey cow that has dropped five living calves. As a heifer she suffered a broken leg, and later was presented to Miss Penrose, who prevailed on her brother to cut it off. Then, with the aid of her father, Miss Penrose made a wooden leg for her charge, and the animal has managed very well with it.

Vice in the Horse.

It is quite true that an expert horseman will often subdue the most refractory of horses, but they are always liable to revert to vicious habits again if they pass into the hands of inexperienced or incompetent horsemen. One of the worst vices in a horse is kicking, whether in stable or at work. We have seen a vicious mare kick the foredoor of a cart to matchwood and smash both shafts. We have seen her, too, throw her hind leg over the pole, when yoked to a mower, and sit down on it, breaking it under her weight. Go she would not, but kept her tail switching round and round.

It is posisble to subdue such an animal for the moment with a drug, and it was often done by crafty dealers in order to effect a ready sale. But drugging is to be avoided. Unless other means are successful it is best to get rid of an animal of the kind at once. There is a market for such. but the price is low.

A Kicker.—A kicker is a dangerous animal, and since it can hardly ever be broken of the vice its absence is preferable to its presence on the farm stud. The old dodge of suspending a small log behind a kicker in the stable and letting it exhaust itself is sometimes effective in reducing the propensity. Often it fails.

Biters are also a source of danger, but except when feeding them corn or when grooming they can be kept under control.

The plan of thrusting a rotten egg or a putrid frog into the teeth of a biter has often been effective.

A rearer in harness may only be mastered by being kept at hard work and rather lightly fed. All intractable horses should be stinted in their feed of grain. The rearer may sometimes be cured by breaking a bottle of cold water over its head. A good douche of cold water is the more effective when the animal is well heated. Straps can be applied to check rearing.

Kindliness and coaxing will invariably be found more effective than harsh or hasty treatment. In almost every case of nervousness or timidity, as in shying, the remedy lies in kindliness, though a firm hand must be held. Strive to gain the confidence of the horse, and the animal will go with you almost anywhere and face any danger.

The Shying Horse.—Shying is not a vice, but rather a temperamental defect, which the animal cannot help. It has no evil intent, it just becomes startled, as by the flutter of a bird, the rustle of leaves, the swaying of a branch in the wind, or the sudden appearance of any unfamiliar being or object. It is futile to whip a horse for shying. Instead of allaying his fears, it only increases his alarm, in which case he may suddenly bolt, with disastrous consequences.

A firm hand must be kept on the reins, and the animal coaxed to advance. The best plan is doubtless to take the horse by the head, pat him on the neck, show him there is no danger, and he will soon get over his alarm.

Horses given to shying should never (while at work) be left standing at the end of the field while the driver goes some distance away on an errand.

If coupled with a staid old horse there may be little risk of the nervous animal bolting on being startled by bird or animal, or even a piece of paper drifting in the wind.

A shying horse is generally the most susceptible to fright or panic when driven alone. Therefore, it is best to hitch the animal to the yoke with a steady-going easy-minded horse. Horses, like men, become crusty or peevish when out of sorts or when weary and exhausted. Hence before we blame the animal we ought to consider first whether we ourselves are not the more blameworthy in any respect in the matter of feeding and general management. Do we always see that the harness, especially the collar, is not irksome to wear? An ill-fitting collar may cause a young horse a deal of discomfort and suffering, and may be a contributory factor in jibbing, rearing, or other undesirable habits.

Don't overload or drive young horses too hard.—''Live Stock Journal,'' England.

Home-Made Leather from Cow Hide.

Mr. H. Cleland, Inspector of Stock, Wanganui, mentions in the "New Zealand Journal of Agriculture" that he has observed a good sample of home-made white leather at a farm in his district from which the farmer was making his own bridles, reins, poll straps, &c. The cow hide was cured by the following process:—Take one full bucket of burnt lime mixed with enough water to cover hide in a barrel or large milkcan. Soak hide for ten days, turning frequently; then take out, spread on floor (concrete for preference), hair side up, and scrape off hair. After taking off all hair, soak for two or three days in a bucketful of bran with water to cover; this will clean up the hide. Next soak for ten days in a solution of 10 lb. salt, 10 lb. ground alum, and 1 oz. oxalic acid, mixing the materials together with sufficient water to cover, and turning the hide frequently. Then tack hide on wall and stretch it as tight as possible. When dry it is fit to use.

Tractor Repairs.

Tractors deteriorate more because of rust, dirt, poor adjustment, and abuse than they do from actual use on the farm, according to a study of factory repair records. This fact leads a New Jersey extension service agricultural engineer to recommend a careful checking, cleaning, and adjustment of the tractor as a preventive of trouble. The following of such a plan, he points out, will result in a longer life and better operation of the tractor.

"Winter is the ideal time for the overhauling and reconditioning," he explains. "Necessary replacements may be obtained at leisure and without interfering with farm operations, as is the case when repairs must be made in the field during the rush season.

"If possible, the crank case of the tractor should be removed and thoroughly cleaned of all sludge and caked oil. Bearings may then be examined for condition, and necessary replacements made. Modern construction often prohibits tightening of connecting rod bearings, and, therefore, necessitates entire replacement of the rod.

"The oil filter should be thoroughly cleaned out and the element renewed. The air filter, whether of the dry or the wet type, will need a thorough cleaning. Magneto breaker points should be smoothed with a contact file, or, if badly pitted, replaced. Readjustments of points to the opening recommended in the tractor instruction book should follow. Clean and adjust spark plugs and replace plugs that are badly pitted. Worm plugs, even though they may fire the charge, are wasteful of power, and their replacement is good economy.

"Frequently it is advisable to remove the front wheels, wash the bearings with kerosene, replace the felt packing washers, and repack with new grease. The transmission units, also, will be benefited with draining out the grease, flushing with kerosene, and refilling with new lubricant."

Cream—Factors Affecting Composition.

The variations that occur in the composition of cream are chiefly the result of its treatment. They are mainly caused by—

(1) The speed at which the separator bowl is turned.

(2) The rate at which milk is allowed to flow into the bowl.

(3) The position of the cream screw in the hood of the bowl.

(4) The temperature at which the milk is separated.

(5) The condition of the milk to be separated.

(6) Mechanical efficiency of the separator.

If the speed is too high the cream is thicker and the test higher; if the speed is low the reverse is the case. An even speed at the specified rate should be maintained.

The faster the milk is allowed to flow into the separator the thinner the cream will be, and the lower the test. Each machine should be fitted with a tinned metal float, which, placed in the top cover, fits into the outlet of the milk vat and regulates an even flow of milk into the bowl.

If the cream screw is turned inwards the cream becomes thicker; if turned outwards the opposite effect is obtained, and the test becomes lower.

Using an excessive quantity of skim-milk or water to flush out the machine when finishing separating will reduce the fat percentage in the cream.

Milk should be separated at about blood-heat—i.e., 90 to 100 deg. Fahr.

A Formula for Whitewash.

Obtain, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water—cold water will do, but hot water is better as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half an inch of water. This is important, for if whilst the lime is slaking it is allowed to rise up above the water in a dry powder it will "curdle." Before the lime commences to boil fiercely, add tallow or common fat in the proportion of about 1 to 2 lb. to 7 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off. If desired, a little yellow ochre may also be added, which will give a cream or buff tint according to the quantity used. When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained and, if desired, may be applied whilst hot.

Food Value of Wholemeal.

The virtues of whole wheat and some means of utilising it formed the subject of a recent talk over the air by the Assistant Organiser of the New South Wales Agricultural Bureau. The food value of wholemeal was greatly superior to that of the refined white article, pointed out the speaker, and on economic grounds, therefore, its use was to be preferred. The home-ground product was especially recommended, a point to be noted by housewives in wheatgrowing communities. While the total amount of grain so diverted from the market might not be very substantial, prevailing wheat prices would seem to constitute a reason for meeting domestic requirements from the farm rather than from the store.

The main reason why wholemeal had not come into more general use, said the speaker, was because white bread had been easy to obtain. We had cultivated such a taste for it, and had grown so to look on it as part of our everyday life, that retailers had hesitated to attempt to displace it with the more nutritious though perhaps slightly less attractive wholemeal product. Those people, however, who had cultivated a taste for the latter eventually preferred it and found that it had properties distinctly conducive to health.

As its keeping qualities were not as high as those of white flour, the home-ground article was especially to be recommended. A small coffee mill or a modern meat-mincing machine with fine adjustment might be used for grinding, while mills specially for the purpose were procurable at quite a small cost, but the ordinary grain crushing machines used on the farm could be availed of with quite satisfactory results. Two crushings were generally necessary to reduce the meal to the required degree of fineness.

Good porridge meal could also be made from whole wheat; this need not be so finely ground as that used for wholemeal flour. It was advisable, however, to soak the porridge meal for twelve hours or longer in water to which a little salt had been added. If it was considered that the bran in either the porridge meal or the flour detracted from the appearance of the finished article or that it was difficult to digest it could be removed by sifting, but for persons of normal constitution this should not be necessary. The varieties of wheat recommended for the making of bread, biscuits, and porridge were Canberra, Waratah, Federation, Marshall's No. 3, Petatz Surprise, and Nabawa.

The housewife who had never used the wholemeal product might perhaps be a little disappointed with the results obtained at first, but after a little experimenting satisfaction was almost sure to be achieved. In order to cultivate a taste for wholemeal in the diet it might be as well to begin with to use white flour with the addition of only a little of the wholemeal, gradually increasing the proportion of the latter.

A Recipe for Wholemeal Bread.

It is satisfactory to learn that interest in wholemeal cooking is gradually increasing. In response to the demand for "something new" in the way of recipes, some attractive ways of utilising this wholesome product will be published in next week's issue of these notes. Meanwhile the following recipe is given for wholemeal bread without yeast:—

Two cups white flour, two cups wholemeal flour, one teaspoon salt, two teaspoons cream of tartar, one teaspoon carbonate of soda, one tablespoon treacle dissolved in a cup of hot water. Mix all dry ingredients together, add a cup of milk to the water and treacle, and mix whole to a soft dough. Place in a covered tin and bake in a moderate oven for almost an hour, making sure that the centre is cooked.

The Farmer and His Money.

There came to us in the course of the month "The Ever Ready Farmers' and Graziers' Complete Account Book," one of the most useful publications of its kind that we have seen. It provides a simplified and complete method of keeping farm accounts, so simple, in fact, that any intelligent schoolboy could with its assistance do the job of tallying income and outgo, and making a permanent and easily checked record of every farm operation. No one enjoys filling up an income tax return, but with this system of account keeping the compilation of tax information is a very simple and accurate undertaking. In fact, under present conditions one could hardly imagine a more useful book, or one in which the various items could be set out more clearly and easily to understand. The book should prove an immense convenience, for it enables any farmer to not only fill up his income tax form accurately, but also to do that very necessary thing—keep a watchful eye on all his operations and every penny of his income and expenditure. From it, he can learn at a glance how he stands and what his general financial position is. The book is obviously the result of great care and study in its compilation. It is complete without being bulky, and makes a complicated operation delightfully simple.

Its thoroughness can be gauged from the fact that the thumb-nail index system of record covers every item associated with the land, carrying right through into a special section which enables taxation returns to be made up by merely adding totals. In his comment on it, Mr. H. E. Flower, Secretary to the Queensland Primary Producers' Co-operative Association Limited, a man of wide country banking experience, says: "Prepared on simple and sound lines—an asset when dealing with financial affairs with the banks, and one that can be thoroughly recommended to anyone faced with the problem of taxation returns." The book is stiff bound, measures 10 inches by 12 inches, and covers five years' operations in its 320 pages. Its cost is three guineas.

Show Ring Manners.

At almost every stock show incidents occur which demonstrate the fact that exhibitors have paid little or no attention to the cultivation of manners in their stock. At the last Pukekohe Show, to take one example out of many, the judge of the Jersey classes, Mr. Jones, of Bell Block, had occasion to complain that a number of young stock—bulls and heifers—showed no evidence of having received any real schooling.

There is something repulsive in the spectacle of a young animal being dragged along by the neck—with the whites of its eyes standing out in affright or from sheer stubbornness—or of being prodded in the rear to force it into any required position.

When big classes are presented to the judge his preliminary inspection is made with the animals on parade, and if they have not been taught to lead properly the stock suffer an immediate and severe handicap. When a beast moves in a distracted condition, or proceeds jerkily, it is not to be wondered at if the judge is immediately and perhaps unconsciously prejudiced against it. If the animal is huddled up, or keeps continuously straining at its halter, it is impossible to form a quick judgment of its merits. The top line, let us say, is a very important point in show stock, and nothing displays that quality so convincingly as well-balanced movements in marching on parade.

It takes time, stock sense, and patience to train a young animal to lead properly. But apart from the show ring itself, it is time well spent, for the acquisition is worth a great deal to the owner later on in the ordinary management of the herd. In the show ring good manners are a definite asset, and without them an exhibit has much less chance of being placed amongst the bunch that is provisionally selected, and from which the final choice is to be made. An easy composure and a ready obedience to halter guidance immediately predispose most judges in favour of the animals possessing those virtues.

In the case of heifers especially the handling and training they receive during a painstaking schooling stand them in good stead in after life in the dairy herd. The training not only makes for the thrift of the animal itself, but enormously eases the task of those who are responsible for its future profit and well-being. For these reasons alone intending exhibitors should see to it that the manners of their stock are rendered as nearly perfect as possible. The benefits accruing will not only be realised in the daily advantages on the farm, but their prospects of success in the show ring will be vastly enhanced.—"New Zealand Farm and Stock Journal."

Australians on Gallipoli—Ian Hamilton's Tribute.

General Sir Ian Hamilton (Commander of the British Forces at Gallipoli in 1915), addressing the Anzac Fellowship of Women, at Australia House, said that the significance of Anzac Day had not dwindled as the years passed. There was a larger crowd at the cenotaph than ever before. Some good came even from war, for without Gallipoli, where the Anzacs formed the most magnificent contingent of men on whom the world had ever set eyes, other countries would never have known the fighting qualities of those who were born beneath the Southern Cross.

Sump Oil for Killing Lice on Pigs.

A friend at Norfolk Island writes that as he has noticed our references to the destruction of lice on pigs by the use of various mixtures, he thought it would be of interest to make known a method which he finds satisfactory.

He advises that he has met with great success by using the waste oil from the sump of his motor car or lorry, this oil being mixed with a small quantity of kerosene and freely applied to the skin of the pigs infested with lice. Many farmers have cars or trucks nowadays and when changing their oil they will find the old oil most useful for freeing his pigs from these blood-sucking parasites. This oil is not so useful for white pigs, as it stains their coats and skin and makes them look unsightly, but is excellent for black, red, or dark spotted pigs. It is a cheap and effective remedy.

Mothers of Men.

In memory of his mother, "his guiding star," Sir Thomas Lipton has given £10,000 for the poor mothers and children of Glasgow. Men who have done big things, who achieve success, who contribute to the world's thought or action, are almost invariably ready to acknowledge openly and generously their debt to their mothers, says an exchange. Men like Edison and Ford have done so. And why not? Every man, whether he becomes a humble clerk or a world-famous general, a chimney-sweep, or a philosopher, owes more than he can calculate to his mother. The loss of a mother in the early years of a boy's or girl's life is always, in some degree, irreparable. It is mothers who safeguard the future. They deserve the recognition of that fact. It is generally all the recognition they get. They do not appear—as mothers—in honour lists, and no flags are flown for them. But their work, their devotion, and their sacrifice are endless and immeasurable. Every man would be all the better if he offered a toast of thankfulness to his mother, or her memory, now and then. No man can say of his life and success, "Alone I did it."—"Brisbane Courier."

Preparing Land for Maize.

The initial ploughing is the most important operation in the preparation of the soil for maize, and on its thoroughness depends to a large extent the yield of the subsequent crop. Under most conditions this first ploughing should take place in the autumn or early winter. It is almost an invariable rule that, other things being equal, the land that has been given the longest preparation or fallow gives the best returns. Despite this fact, much of our maize land is still left unploughed during the winter months.

Land ploughed at the period indicated and left in the rough state during the winter is greatly benefited by the mellowing action of frosts, and is open to receive the winter rains, both of which penetrate more deeply into the soil and subsoil. This, with the greater aeration of the soil, materially improves the soil's chemical and physical character, especially if the ploughing be deep and thorough.

Where undulating land is left unploughed during the winter, much of the rainfall is lost by running off the hard surface. Most of this could be conserved if the land were deeply ploughed and left rough. On hillsides and where the winter rains are excessive it may be found advisable to plough the land in autumn and plant a cover crop like peas, clover, or rape to cover the ground during the winter and prevent erosion of the soil. In all cases where hillside land is cultivated it is preferable to plough and plant across the slope of the hills in order to save the soil from washing.

On flat lands that drain poorly recourse may often be had to ploughing the ground in narrow strips about 8 feet or 12 feet wide, on which two or three rows of maize are planted, with a "dead" furrow or open drain between each strip to carry off the surplus moisture.

Bacon for Bliss.

The Dunmow (Essex) custom of awarding a flitch of bacon to couples testifying to a year of unruffled happiness was at one time a solemn business. Who instituted it is not known; why he did so was still more mysterious. Some writers blame Lord Fitzwalter in the reign of Henry III. He is said to have decreed that "whatever married man did not repent of his marriage, or quarrel with his wife in a year and a day after it, should go to his priory and demand the bacon, on his swearing to the truth, kneeling on two stones in the churchyard."

Bacon, of course, may have been a priceless household commodity in the thirteenth century.

A Smart Answer.

It is said that order is one of heaven's first laws and a necessity in life.

Billy had become the proud owner of a pig for his pig club contest and insisted (as was quite right) on feeding and caring for it himself. After a few weeks' work his father noticed that the animal was not as fat as he thought it should be, so he remarked to Bill, "Look here, young feller, me lad, you are not feeding your pig enough, it doesn't seem to be fattening at all." "I don't want him to fatten yet," answered Billy, "I'm waiting until he gets as long as I want him, then I'll begin to widen him out."

Citrus Packing Points.

Exercise extreme care in handling.
Place fruit carefully in picking bags.
Carefully transfer fruit from picking bag to box.
See that the box has no protruding nails or splinters.
Do not jolt the fruit over rough roads.
Grade carefully for size and quality.
See that the sizing machine is functioning properly.
Use a clean case.
Pack neatly and tightly, but do not squeeze or jam fruit into boxes.
Stack cases on sides.

Stock Poisoning—The Effects of Cyanide of Potassium.

The Chief Veterinary Surgeon of the New South Wales Department of Agriculture (Mr. Max Henry), discussing the poisoning of animals with cyanide of potassium, says that the ingestion of cyanides in mortal doses leads to rapid death by cardiac arrest, although a death from cyanides may not be so rapid as would be the case if the pure drug were administered. It would depend upon the rate of decomposition of the cyanide in the stomach. Where death is somewhat delayed there is first a stimulant action of short duration.

The main symptoms noted in experiments at Glenfield Research Station were—(1) Very deep but regular respiration, usually occurring within two minutes of administration; (2) rapid and rather embarrassed respiration, usually occurring within five to ten minutes after administration; (3) salivation; (4) loss of power in the limbs, particularly the hindquarters, occurring in from seven to fifteen minutes after administration; (5) convulsive struggles while lying on the side, and may be respiration in great spasms; (6) gasping, respiration, and death in fifteen to fifty minutes.

In some of the cases at Glenfield there was a bluish coloration, but this was not regularly present. On most post mortem examinations it was found that the lesions varied to a considerable extent. In some cases the pathological changes seemed to be almost absent. The congestion of the lungs present in some cases was absent in others. At times there were some congestion of the mucosa of the gastro intestinal canal, at other times there was a generalised splanchnic congestion.

Regarding exposed baits and the suggestion that slower action might occur if the drug were weakened, Mr. Max Henry says experiments carried out indicated that small doses of cyanides given at regular intervals did not cause death unless the doses were given at such short intervals that the animals accumulated a lethal amount in the system, when the effect was the same as with an ordinary lethal dose. Cyanides, he adds, are rapidly eliminated from the system and do not have accumulative effect.

Protein Concentrates for Pigs.

Writing in regard to the use of protein concentrates in the feeding of pigs, Mr. S. E. Smith, a prominent farmer, of Hopevale, Bajool, Central Queensland, advises that since he has been including a proportion of protein concentrates and mineral matter in the food given to his pigs, he has been able to get his stock away at least one month earlier than was the case prior to the inclusion of these very necessary, flesh, bone, and blood-forming units to the food. His experience should be of interest to farmers who are having difficulty in getting their stock away at a reasonable age and weight.

The use of such foods, plus abundant supplies of green food, and fresh drinking water is always advised.

Points in Lamb Marking.

The main consideration in lamb-marking, apart from the prevention of actual mortality, is the avoidance of any decided check in the growth of the lamb. Lambs should be marked as early as possible so long as they are healthy and active; if the operation is left too long there is more chance of a setback from loss of blood. The operation should be performed in the morning so that the lamb will have the bulk of the day in which to find its mother. If it is left until late in the day losses are likely to occur, especially if the night is cold.

The sheep should be mustered some time before the operations commence and the lambs allowed to settle down. There should be no rushing about, and dogs should be used as little as possible, as deaths from hemorrhage are very common when lambs are marked in an excited and overheated condition.

Cleanliness is vital in lamb-marking—heavy losses from various infections take place annually through sheepowners' failure to recognise this fact. The knife used for docking and tailing calls for special attention. The most suitable type has the blade and handle all in one piece, but in any case it should be as plain and as sharp as possible, since germs may be harboured in joints or corners and even in cracks in the blade or in slight irregularities in the cutting edge. Prior to the commencement of the operations the knife should be boiled, and it should be carried to the yards in the liquid in which it was boiled. Throughout the marking the knife should be dipped as frequently as possible in a carbolic solution or other disinfectant; and whenever it is out of the operator's hand it should be allowed to remain in the disinfectant.

Dirty yards are a breeding ground for various dangerous organisms, and the choice of the site for the operation is therefore important. It should be perfectly dry and well away from dust and dirt so as to minimise the risk of losses from lockjaw and blood-poisoning, and if the flock is not too large it is best to use temporary yards made of movable hurdles of wire-netting and stakes, in a fresh paddock each year. With large flocks this is perhaps impracticable, and the following treatment of the yards is recommended:—Remove the surface soil of the yards to a depth of about 6 inches, and place it in a heap, where it should be thoroughly mixed with quick-lime; then saturate the fresh surface exposed with a strong solution of non-poisonous sheep dip.

In addition to the above precautionary measure it is essential to adopt some means of preventing the germs of disease from gaining entrance into the flesh-cuts made in the scrotum and tail. As the yards, although the main, are not the only source of infection, it is recommended that wounds of the scrotum and tail be either smeared with tar or dressed with carbolised oil (1 part of carbolic acid to 12 parts of oil) before the lamb is released after the operation. This is most important.

Lambs dead of tetanus or other of the inoculable diseases commonly contracted during marking, if not destroyed, form fresh centres of infection by absorption of the micro-organism by the earth. All carcases should therefore be destroyed by burning.

When marking lambs in temporary yards or in a corner of a paddock, care must be taken that the ewes are not allowed to spread too far in the paddock before the lambs are released. Although it is inadvisable to keep the ewes and marked lambs in a yard for any length of time after marking, a little shepherding of the flock in the paddock will repay the owner by ensuring that the lamb obtains a drink of milk as soon as possible after the operation. Very often it is found that a number of lambs which are possibly more seriously affected by the operation will hang about the gates of the yard, and if the ewes are not kept handy for at least a little while these lambs will probably become isolated and lost.—*A. and P. Notes, New South Wales Department of Agriculture.*

Freak Pigs.

Following on a report of freak pigs in different parts of the world, it is of interest to note, that, on a recent visit to the Mount Alford district, in Queensland, Mr. Shelton, Senior Instructor in Pig Raising, saw a young pig with only three legs; one of the forelegs was missing altogether and the pig was able to move about with a reasonable degree of certainty, although, at time of inspection, he was but two or three days old and was one of a litter of twelve, owned by Mr. McNulty, a prominent farmer in that district. So interested were the residents that the pig was exhibited at Mount Alford Pig Club.

The Pig's Appetite.

The pig is a greedy feeder if he is healthy and active, but is a poor feeder if he is sick or indisposed. His appetite varies in accordance with his bodily spirits, and while in normal health he requires but little attention—when he is ill he is a very bad patient. His diet constitutes one of the most important factors concerned with the success attendant upon his production. He must eat large quantities of food to be able to grow and develop satisfactorily, and he must be able to assimilate his food properly in order to extract all the nutriment as it passes through his body. His health and rate of growth depends upon the character of the food given, while the quality of the food will be reflected in the quality of the flesh produced. If soft, oily food is fed, like an excess of peanuts, soft, oily pork will result; if bulky but poor quality food is given (like diluted buttermilk) a soft, flabby pork will result that will not set properly on slaughter. If rancid high-smelling food is used, the resultant pork will be of inferior flavour, while if his food is too dry and coarse digestive troubles ensue and his general health and well-being will be disturbed.

Milk provides a complete food for young life both human and animal, but when, say, skim milk is diluted with 50 per cent. of water it becomes useless as a food. One often notices farmers diluting whey and expecting good results. Whey in itself is purely sweetened water with a low food value and is not as useful as a pig food as is skim milk (undiluted). The chemical content of milk indicates its value in providing the wherewithal to build up healthy flesh for it has a good sugar and fat content, its nitrogenous content builds up flesh, while its mineral content supplies the necessary elements for making of bone and muscle. If milk is used, therefore, it must be of good quality and in liberal supply. Root crops like sweet potatoes need to be sound and of good quality.

Too many farmers refuse to give these to the pigs until they become rotten, and it is often the case with pumpkins, the pigs only get them when they are decaying and, of course, they are then of little or no value for pig food.

Good food, in liberal supply, at regular intervals, is necessary in order to strengthen the animal's body and enable it to make satisfactory growth.

Export of Pork.

In view of the prominence being given to the possibilities of the export of frozen pork, it is well to understand the position in so far as it relates to this grade of stock.

Porkers are pigs weighing from 80 lb. to 100 lb. live weight, and dressing out at from 65 lb. to 75 lb. or 80 lb. weight at about four and a-half to four and three-quarter months old. Porkers should be ready for market before they are five months of age if they are well fed and cared for, though numbers of porkers at five and six months of age reach the markets every year, these pigs being slow growing and not as profitable as they ought to be, though in actual practice they are often looked upon as being quite profitable.

There are three grades known, respectively, as light (50 lb. to 60 lb. dressed), medium (60 lb. to 75 lb. dressed), and heavy (75 lb. to 95 lb. dressed). Porkers usually realise from 36s. to 46s. each, at which price they should be profitable if farm-grown foods, plus a supply of concentrated meals and minerals, are being utilised, and if seasonal conditions favour rapid growth and early maturity.

At present numerous breeds and crosses are proving satisfactory, and there has been no special inquiry for any particular breed or cross, but the business is an extremely important one, and one that breeders should be keenly interested in, for as competition and supply increases the buyers will become more particular, and then only properly graded even lines of pigs will be considered.

Inspection by Commonwealth meat inspectors is very strict, and only the very best grades of porkers have any hope of being accepted for export. In consequence the percentage of rejects is very high, and these are also less profitable than they ought to be. It behoves pig breeders to be up and doing in regard to the export trade.

Treat the Stock with Kindness.

When farm animals, accustomed to kindness, have confidence in their master, both man and beast are spared many a wearing chase, says an Irish contemporary. Time and trouble in gathering them, or in removing them from place to place on the farm, are nothing compared with the labour and the time occupied in dealing with wild, timid, unhandled cattle; whilst the expenditure of food to bring to equal condition the beast that starts at every sight or sound, rises to prepare for escape on the approach of man, and is always on the look-out for disturbance, and the one that lies still, sleepily chewing its cud, never for one moment occupied with any kind of fear, is considerably greater in the case of the former than of the latter.

Pig Feeding Experiments.

One of the most up to date and progressive institutions in the world is the Harper-Adams College and Pig Feeding Experimental Station in Great Britain. Established in 1925-6 as a part of a co-ordinated scheme in experimental research it has been productive of much good in fostering the co-operative spirit between such institutions as the Animal Nutrition Research Institutes at Cambridge and Aberdeen respectively. Its primary object is to undertake co-operative experiments with the other centres included in the scheme of feeding problems which are undergoing more extensive study at the two research institutes. The experiments are mostly of an indoor nature, but are carried out on strictly practical lines. Principal Charles Crowther, M.A., Ph.D., indicates that extensive pig feeding experiments are in progress and that during recent years extensive additions have been made to the accommodation and plant to enable the work to be carried out more efficiently.

The Farm Horse.

Discussing the value of horses in economical farm production, Mr. E. B. Comans, honorary secretary of the New South Wales Section of the Commonwealth Clydesdale Horse Society, in a paper read at a recent farmers' gathering, referred to the growing demand for draught stock as a result of the prevailing adverse conditions and to the possibilities of horse-breeding.

Mr. Comans warned farmers against the haphazard methods of breeding that had been followed in the "good days" and urged more discrimination in the selection of breeding stock and more care in regard to the feeding of the young stock. As a means of ensuring the breeding of horses on the best lines some thought must be given to the selection of a stallion or stallions for a district. It was essential that entires free from hereditary unsoundness and of recognised pure breeding only should be used for stud purposes. It might not be possible for any one farmer to raise horses enough on his own farm to warrant him keeping an outstanding sire on the place, and the fee required might be too high for ordinary farm mares. Horse-raising had been most successful when only a comparatively few brood mares were kept on one farm and the mares were worked or kept well exercised and handled in such a way thatboth mare and foal could be given sufficient individual attention. Losses appeared to increase when a large number of mares were kept on the one place. If a mare was kept idle throughout the year and did not work, other than raise a foal, production costs were increased. A small number of mares under more direct control were more likely to give better returns than a large number which could not receive proper attention.

The Clydesdale type predominated in most districts, said Mr. Comans, and it should be the aim to improve on that type, which could be done only by persistently using the same breed. In this way only could the standard of the draught horse be raised, and it should be the object of every breeder to keep on "grading up" his horses, and by the use of purebred sires eventually to breed up to purebred standard.

In recent years some of the wheat-growing districts of New South Wales had built up a name for the standard of their draught stock, particularly Mudgee, Wyalong, Ariah Park, and Culcairn, whilst the Hawkesbury district (Windsor-Richmond) had again shown a disposition to become a centre for good stock. An extension of breeding on similar lines was required. What had been done in those districts it was possible for other districts to achieve. It was very simple and amounted to the use of purebred, sound, and prepotent stallions. In each instance the results had been achieved by the efforts of an enthusiast who had taken a good stallion into those districts. The farmers supported him, and for years past they had continued to support him, with the consequence that those districts stood high to-day in the standard of their horse stock.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

DANGERS UNTHOUGHT OF.

AMONG the diseases which are spread by germs distributed in the air by coughing are measles and whooping cough. They differ from the "common cold" in the lifelong protection which follows an attack, for second attacks are almost unknown. The infection is very certain, and very few escape. Children who have not suffered from them before become infected by their schoolmates or playfellows, and then take the disease home to their younger brothers and sisters. The younger the child the more serious the disease. Fortunately babies rarely contract measles; during the first year of life they inherit some natural protection. Unfortunately with whooping cough this is not so. The youngest and feeblest infant catches the disease.

Common Colds.

"Common colds" and influenza, which vary from the most trivial to the most fatal diseases, give very little and short protection. We may suffer from them repeatedly. They are spread mostly by adult carriers, and infections are most likely in crowded halls, such as picture shows, especially if these are ill ventilated. To take babies and young children to these entertainments is to expose them to dangers of which some mothers seem unconscious. For instance, not long ago a dance was held in a country township. Wrapped in blankets under the chairs lay babies, their nerves jangled with noises, their breathing partly chocked by dust, inhaling whatever disease germs might be present in a mixed assemblage. It grieves us that dogs, cats, and kookaburras show more sense in the care of their young ones than do some human mothers.

Transference of Disease Germs.

In diphtheria and scarlet fever there is often no cough, and infection is not conveyed with the same certainty. It depends mostly on the transference of disease germs from the secretions of the mouth and nose by means of children's fingers. The infection is most often received from carriers or very mild cases, not from those who are evidently sick. We may say, as a rule, of any small child, that if its saliva were the colour of ink, its hands, face, clothes, and toys would be inkstained, and so would those of its playmates. It is therefore easy to understand how disease germs are conveyed from one to another. There are very good reasons for believing that other very serious diseases—meningitis, inflammation of the brain, and infantile paralysis—are spread in exactly the same way.

Dangerous Habits.

The baby in his first year, of course, puts his fingers into his mouth, but this is no danger to others, for, though he may receive infection in this way, he is himself free from disease germs until infected. But when he begins to run about with others he becomes a possible carrier, more dangerous each year as he grows older. Not until he has been some years at school does the ridicule and rough discipline of his fellows break him of his dangerous habits, and not then always completely, for we may frequently see relics of them in fully grown-up people. All this should be altered. Even in the first year the mother should see that finger-sucking does not become a habit. As soon as the child toddles, she should train him to keep his hands clean and dry from spittle and mucus. This is dangerous and harmful dirt though invisible. The visible dirt, which sticks to healthy little hands and faces is, in comparison, quite a harmless thing.

Dangers are not the least little bit lessened by being unthought of. So long as we break one of the laws of health, so long will Nature continue to exact her punishment. The fault is ours; it is our children whom she punishes.

THE COUNTRY WOMAN.

By arrangement with the Domestic Science and Technical Services of the Department of Public Instruction, information of especial interest to country women is published regularly under this heading.

SIMPLE COOKING.

IRISH STEW.

Materials—1 lb. neck chops or 1 lb. steak; ½ lb. onions; 1 lb. potatoes; 1 tablespoonful flour; salt; pepper; 1 pint of cold water.

Utensils—Board; knife; bowl; cloth; saucepan; meat dish.

Method—

1. Wipe the meat; trim chops or cut steak into pieces; roll pieces in flour, pepper, and salt.
2. Put meat into a saucepan with water.
3. When the water boils, skim off fat and scum.
4. Wash and prepare the vegetables.
5. Slice the onion and cut potatoes into halves.
6. Put onions and seasoning on the meat.
7. Place the potatoes on the top.
8. Cook gently for 2½ hours.
9. Add more water if required.
10. Place the meat on a hot dish.
11. Put potatoes round it.
12. Pour gravy over the meat.

SODA LOAF.

Materials—½ lb. flour; ½ teaspoonful carbonate of soda; 1 teaspoonful cream of tartar; 1 teaspoonful dripping; ¾ cup milk; ½ teaspoonful salt.

Utensils—Bowl; sieve; cup; brush; tin; cloth; board.

Method—

1. Sieve all dry ingredients into a bowl.
2. Rub dripping through with tips of fingers.
3. Add milk; make into a dry dough.
4. Form into a loaf; brush over with milk.
5. Bake in a hot oven for half an hour; wrap up in a clean cloth.

BOILED BEANS.

Materials—½ lb. beans; 1½ pints of boiling water; ½ teaspoonful salt; ¼ teaspoonful carbonate of soda; 1 teaspoonful butter.

Utensils—Bowl; saucepan; knife; vegetable dish.

Method—

1. Wash beans.
2. Remove sides and ends; slice finely.
3. Put into a saucepan of boiling water.
4. Add salt and soda; boil 10 minutes.
5. Strain; add butter and pepper; mix well; serve.

STEWED PRUNES.

Materials—¼ lb. prunes; 1 cup water; 1 tablespoonful sugar.

Utensils—Basin; saucepan; spoon; glass dish.

Method—

1. Wash prunes; soak them over-night in a little water; strain.
2. Put strained water into a saucepan.
3. Pour in prunes.
4. Cook gently till tender; add sugar; boil up; allow to cool.
5. Lift prunes out; place in a glass dish.
6. Strain juice over prunes.

Note.—Other dried fruits may be cooked similarly.

BOILED EGGS.

Material—1 egg.
Utensils—Saucepan; egg cup.
Method—

1. Put saucepan of water on fire; when boiling, add egg.
2. Boil for 3 minutes.

SCRAMBLED EGG.

Materials—1 egg; 1 tablespoonful milk; ¼ teaspoonful chopped parsley; 1 pinch salt; 1 pinch pepper; piece of buttered toast.

Utensils—Saucepan; wooden spoon; knife.

Method—

1. Put milk into a saucepan; break egg into it.
2. Add salt, parsley, and pepper.
3. Place on fire; stir well for 2 minutes.
4. Place on buttered toast.

SAUSAGE ROLLS.

Materials—½ lb. mince meat; salt and pepper; 1 dessertspoonful flour. For pastry: ½ lb. flour; ¼ teaspoonful salt; ¼ lb. dripping; ½ cup water; 1 teaspoonful baking-powder; 1 teaspoonful milk for brushing over.

Utensils—Saucepan; bowl; sieve; brush; tin.

Pastry.

Method—

1. Sieve all dry ingredients into a bowl.
2. Rub dripping through with tips of fingers.
3. Add water; make into dry dough.
4. Knead; roll out; cut off edges; cut into squares.
5. Place meat at one end of each square; roll up.
6. Mark; brush over with milk.
7. Bake in a hot oven 20 minutes.

Meat.

1. Mince meat; put it into a saucepan.
2. Add salt, pepper, and flour.
3. Place on fire; cook till brown, stirring well.

Quantities sufficient for 1 dozen rolls.

Note.—In most recipes, when possible, butter may be used instead of dripping or lard.

MADEIRA CAKE.

Materials—¼ lb. dripping; ¼ lb. sugar; 3 eggs; 5 oz. flour; 1 teaspoonful baking-powder.

Utensils—Bowl; basin; sieve; wooden spoon; spoon; cake tin.

Method—

1. Put dripping and sugar into a bowl.
2. Beat till creamy.
3. Add eggs one by one, beating all the time.
4. Add flour sifted with baking-powder.
5. Put mixture into a well-greased tin.
6. Bake in a moderate oven for 1 hour.

Note.—A few drops of vanilla may be added after the flour.

CLARIFIED FAT.

Materials—½ lb. mixed fat or suet; ½ pint water.

Utensils—Iron saucepan; iron spoon.

Method—

1. Remove any small pieces of meat from the fat.
2. Cut the fat into pieces, about 1 inch square.
3. Place in an old iron saucepan.
4. Add water; cook for half an hour with lid on.
5. Remove lid and stir frequently till all the water has evaporated.
6. Continue cooking and stirring till the fat is melted and looks like clear oil.
7. Strain, pressing the pieces well to extract all the fat.
8. Allow it to get cold; it should then be hard and white.

PEA SOUP.

Materials—6 oz. peas; 2 onions; 1 turnip; 1 carrot; 5 pints water; 2 tablespoonfuls flour; 2 dessertspoonfuls mint; bacon bones or rind; beef bones; pepper; 1 dessertspoonful salt; 2 slices toast.

Utensils—Saucepan; basin; spoon; knife; sieve; cup.

Method—

1. Wash peas and soak them over-night in cold water.
2. Put peas and water into a large saucepan; add bacon rind, salt, and water.
3. Remove the fat from bones; chop them up small and put them into saucepan.
4. Bring the contents of the saucepan slowly to the boil.
5. Peel or scrape, wash, and cut up the vegetables.
6. Put vegetables and spices into the saucepan; boil slowly for 3 hours.
7. Rub through a coarse sieve or colander.
8. Return to saucepan; bring to the boil.
9. Blend flour smoothly with cold water.
10. Stir into the soup and boil slowly for 3 minutes; add chopped or powdered mint.
11. Serve in hot soup tureen with small cubes of toast.

LAUNDRY WORK.

1. The washing day should be early in the week. Tuesday is a suitable day, because preparation may be made on Monday.

2. The boiler fire should be made ready before washing day; cinders and ashes should be removed, and the flue cleaned. Water must be put into the boiler before the fire is lighted. After use, the inside of the boiler should be cleaned and carefully dried.

3. An early start should be made to avoid heat and to take advantage of the morning sun for drying clothes.

4. Have soap jelly, blue, soda, and all necessaries at hand.

5. Clothes and articles used by sick persons should be disinfected before they are washed.

6. To disinfect clothes they should be soaked for several hours in cold water to which disinfectants, such as carbolic acid, phenyl, or kerol, have been added.

7. Stains caused by paint, ink, fruit, mildew, ironrust, tea, coffee, or cocoa must be removed before clothes are soaked, because—

(*a*) Stains are more easily removed when fresh.

(*b*) Most stains are fixed by soap.

8. Chemicals or other substances used to remove stains must be washed out from fabrics quickly by repeated rinsing, otherwise the materials may be destroyed.

9. All articles except stockings and very dirty garments should be mended before being washed.

10. Rain water is best for laundry work, because it is soft. Soft water dissolves soap rapidly and produces a lather.

11. Hard water is wasteful because much soap must be used; it may be made soft by boiling, or by adding soda, borax, or ammonia.

12. Soaking or steeping is necessary in washing clothes; it loosens dirt and makes it easy to remove, without injuring fabrics by rubbing.

White clothes should be soaked in warm water to which has been added melted soap, soda, or borax. If possible allow clothes to soak over night.

13. Soiled parts, such as neckbands and wristbands, should be rubbed with soap in the soaking water.

14. Table linen should not be soaked with bed or body linen.

15. Table linen should be slightly stiffened with starch; the starch may be added to the rinsing water.

16. Soda or washing powder must be used to remove dirt from dusters; if coloured, they should be rinsed finally in water to which salt has been added.

17. Water to which ammonia has been added is used for washing silk, flannel, and woollen garments; it should never be used for coloured articles.

18. To 6 gallons of water add ¼ pint of soap jelly and 2 tablespoonfuls of liquid ammonia.

19. Ammonia should be kept in bottles with glass stoppers and great care must be exercised in its use.

LIST OF LAUNDRY UTENSILS.

Mangle.
Set ferro-concrete tubs, or 3 galvanised iron tubs.
Washing boiler.
Wringing machine.
Linen basket.
Clothes basket.
Drainer.
Iron bucket.
Washing board.
Saucepan.
Clothes-line
Props.
Enamelled basin.
Dipper.
Scrubbing brush.
Bag for boiling small articles.
Knife.
Wooden spoon.
Copper stick.
Pegs.

Note.—Utensils should be cleaned every week.

To Clean a Copper.

1. Remove water from copper.
2. Scrub sides and bottom, using sand soap or ashes.
3. Dry thoroughly.

To Clean and Oil a Mangle.

1. Oil tension screw, wheels, and working parts.
2. Wipe away superfluous oil and dust all metal parts.
3. Wipe rollers with a damp cloth.
4. Dry thoroughly.

To Make Soap Jelly.

Method—

1. Shred soap into a saucepan.
2. Cover with hot water.
3. Let stand for ten minutes.
4. Place over fire; stir till dissolved.

To Make a Blue Bag.

Method—

1. Place ball of blue in centre of flannel.
2. Cover with calico.
3. Tie tightly.

Materials—

Pieces 4 inches by 4 inches of white flannel and white calico; 6 inches white tape or cord.

To Make Blue Water.

Method—

1. Partly fill tub with water.
2. Dip the blue in its bag into the water; let it soak for half a minute.
3. Squeeze the blue bag; repeat till water held in the palm of the hand is slightly blue.

To Make Boiled Starch.

Method—

1. Put on a kettle of water to boil.
2. Place starch in an earthenware basin.
3. Mix it with cold water till starch is smooth.
4. Rub soap on hands in the blended starch till a lather is formed.
5. Stir starch well with an iron spoon.
6. Pour in boiling water, stirring well till starch becomes clear.
7. Dissolve borax in one tablespoonful of boiling water.
8. Mix it with starch.

Materials—

2 oz. or 2 tablespoonfuls starch; 4 tablespoonfuls cold water; enough soap to make a good lather; 1 quart of boiling water; ½ teaspoonful borax.

Note.—If starch is not required at once it should be covered to prevent a skin forming on top.

To Make Cold Starch (1.).

Materials—

1 tablespoonful of starch.
4 drops of turpentine, ¼ teaspoonful butter, or a piece of wax candle.
½ teaspoonful borax.
½ pint of cold water.

Method—

1. Mix the starch to a smooth paste with a little of the cold water.
2. Drop in the turpentine, butter, or wax.
3. Add the borax, previously dissolved in hot water.
4. Add remainder of cold water.

Stir well each time before use, as the starch sinks to the bottom. If the starch is good it settles into a solid cake.

Cold starch is always better if made a short time before it is needed; the standing softens the starch grains; they burst and swell when the heat of the iron is applied, entering the material and giving it the required stiffness.

To Make Cold Starch (2.).

1. Put starch into a bowl; add 3 cups of water; mix well.
2. Put borax, glycerine, and 3 cups of water into a saucepan; bring to the boil.
3. Add the boiling mixture to the blended starch; stir well; strain.

Materials—

6 cups water; 1 cup starch; 2 oz. lump borax; 1 teaspoonful glycerine.

REMOVAL OF STAINS.

Tea, Coffee, or Cocoa.

Method—

1. Spread the stained part over a basin.
2. Rub well with powdered borax.
3. Pour boiling water through.
4. Soak the article in clean water.

Ink.

Method—

(*a*) 1. Wet the stained material with peroxide of hydrogen.
2. Allow the wet part to dry; repeat till the stain is removed.

FRUIT PRESERVING.

Fruits are composed of water, sugar, gum, acid, pectose, ethers, and essential oils.

The agreeable qualities of fruits depend upon—

1. The proportion of soluble matter mixed with tough fibrous matter.
2. The proportion in which sugar, gum, and pectose are mixed with acid.
3. The aroma, fragrance, or perfume due to ethers alone, or to ethers combined with essential oils.

Peaches, some plums, strawberries, mulberries, custard apples, and similar fruits contain a large amount of soluble matter; some kinds of mangoes are stringy because they contain a large proportion of insoluble matter.

Peaches and apricots carry a small amount of sugar in comparison with the free acid they contain; the acid, however, is not perceptible on account of the large

proportion of gum and pectose in these fruits. Gooseberries and currants (white, red, and black) are very acid because they contain relatively small amounts of gum and pectose.

Citrus fruits owe their aroma and flavour to ethers combined with essential oils.

When the juice of fruit is boiled with sugar the pectose in the presence of acid causes it to jelly; pectose is at its best for this purpose when the fruit is just ripe or immediately before it ripens.

Fruit-juice will not jelly—

1. If the fruit is over-ripe.
2. If the juice has fermented.
3. If the juice is boiled too long with the sugar.

Pectose produces pectin only in the presence of acid; hence if fruits which contain little acid are used to make jelly—

(*a*) They must be made into jelly before they are ripe, or
(*b*) They must have acid fruits mixed with them, or
(*c*) They must have lemon juice, cream of tartar, or tartaric acid added to them.

To Preserve Fruit or Other Food.

1. Fruit, food, utensils, and jars must be sterilised by being brought to a temperature of 212 deg. Fahr.

2. Moisture must be removed by some drying process.

3. A preservative must be used.

4. The jars, cans, or other receptacles in which the food is to be kept must be sealed.

PRESERVATION OF FRUITS AND VEGETABLES GROWN IN QUEENSLAND.

Queensland Fruits and Vegetables suitable for Jam or Marmalade.

Note.—Those suitable for Jelly as well are *italicised.*

Fruit.	Time of Year in Season.
Apple	December to March.
Apricot	December and January.
Blackberry	
Cape Gooseberry ..	Practically all the year.
Cherry	November.
Choco	January to August.
Citron	April to September.
Cucumber	
Cumquat	April to September.
Damson	December to February.
Fig	November to March.
Gramma	From January to June.
Granadilla	Practically all the year in the North; heaviest crop, June to September.
Grape	December to March.
Greengage	December to February.
Guava, Red	January to February.
Guava, Yellow	January to March.
Guava, White	January to March.
Jujube (China Apple) ..	June and July.
Kei Apple	Autumn.
Lemon	March to September.
Lilly-pilly	June and July.
Lime	March to September.
Loquat	Early Spring.
Mandarin	April to September.
Mango	September to March.
Melon, Rock	Summer.
Mint	

Queensland Fruits and Vegetables suitable for Jam or Marmalade—continued.

Fruit.	Time of Year in Season.
Mulberry	Early Summer.
Nectarine	December and January.
Orange, Seville ..	May to September.
Orange, Sweet	March to December.
Passion Fruit	Summer and Winter crop.
Papaw	Heaviest early Summer.
Peach	December to March.
Pear	January and February.
Persimmon	December to May.
Pie-melon	Summer; melons should be stored for two or three months before use.
Pineapple	All the year; main crop Spring and January-February.
Plum	*See* Greengage.
Plum, Burdekin ..	June to August.
Pomelo	*See* Orange.
Prickly-pear	
Pumpkin	*See* Gramma.
Quince	February to March.
Rhubarb	Winter and Spring.
Rosella	February to April.
Shaddock	*See* Orange.
Strawberry	June to December.
Tomato	All the year.
Vegetable Marrow ..	Spring and Summer.

Queensland Fruits and Vegetables suitable for Sauces, Chutney, &c.

Fruit and Vegetables.	Time of Year in Season.
Artichokes	Autumn.
Beans, String	All the year.
Beetroot	All the year.
Cabbage	All the year.
Capsicum	Summer and Autumn.
Cauliflower	Early Spring.
Celery	Winter and Spring.
Chili	*See* Capsicum.
Cucumber	All the year.
Gherkins	All the year.
Horse-radish	All the year.
Mint	All the year.
Mushrooms	Whenever there is suitable rain.
Nasturtium	May to October.
Olive	February and March.
Onion	Main crop, December and later.
Soy	Would ripen January and February.
Walnut	December.

Queensland Fruits, &c., suitable for Drying and Storing.

Fruit.	Time of Year in Season.
Almond	February.
Banana	All the year.
Cocoanuts	All the year.
Date	Not grown commercially.
Queensland Nut ..	Late Autumn and Winter.
Peas	Spring.
Beans	Summer and Autumn.

TIMES DURING WHICH CERTAIN FRUITS AND VEGETABLES MAY BE TREATED.

January and February.—Grape jam; Isabella grape jam; grape jelly; grape and apple jelly; grape and lemon jelly; grape syrup; preserved grapes; damson jam; damson sauce; damson butter; preserved damsons.

January to April.—Guava jelly.

February and March.—Quince jam; quince jelly; quince marmalade; preserved quinces; preserved mandarins; limejuice cordial; nut butter; banana chutney; noyeau.

March and April.—Tomato jam; tomato sauce; green tomato chutney.

March to June.—Preserved pears; choko jam; prickly-pear jelly, pickled chokoes.

March to August.—Bush lemon jelly; bush lemon marmalade; lemon cheese.

March to September—Marmalades: Seville or bitter oranges, sweet orange, lemon, grape fruit, shaddock, citron.

April and May (in North Queensland all the year).—Rosella jam; rosella jelly; rosella pickle; dried rosellas.

April to October.—Pickled beetroot, cauliflower, cucumber, chokoes, gherkins, onions; red cabbage; mixed pickles, piccalilli.

April to November.—Preserved cumquats; cumquat marmalade; lime jelly; candied lemon peel.

May to September.—Stuffed oranges in syrup; orange slices in syrup.

June and July.—Burdekin plum jelly; jujube apple jelly.

July and August.—Melon and ginger jam; melon and lemon jam; melon and orange jelly; melon and tomato jam; mock ginger; pie-melon chutney; pumpkin or gramma jam; vegetable marrow jam.

July to November.—Strawberry jam; strawberry conserve; strawberry syrup.

August and September.—Cape gooseberry jam.

September.—Loquat jam; loquat jelly.

September to April.—Smooth-leaved pineapple jam, preserved pineapples, crystallised pineapples.

November.—Cherry jam; crystallised cherries; granadilla jam; pickled walnuts.

November to February.—Apricot jam; dried apricots, peaches or plums; dried apricot jam; preserved apricots, peaches, nectarines, or plums; crystallised apricots; plum jam; peach jam; peach conserve; plum sauce; macedoine of fruit; passion fruit jam; fruit mince meat.

November to March.—Preserved mangoes; mango chutney; mango sauce.

November to April.—Papaw and apple jam; papaw and pineapple jam; preserved papaw; papaw chutney.

December to February.—Apple jelly; apple ginger; apple marmalade; preserved apples; Brazilian cherry jelly; rhubarb and apple jam; Kei apple jelly.

December to March.—Fig jam.

FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07, increasing gradually to a rainfall of 7.69 in. in February.

POULTRY ON THE FARM.

THE care of poultry on the farm is usually left to the women folk, and they look on the return from eggs as a source of pin money. As a rule the hens have to shift for a living, picking up what scraps they can get hold of, and perhaps get a feed of grain in the evenings. The average flock of fowls on a farm is usually a very mixed lot; here and there one finds the exception in a flock of purebred birds, well looked after and paying a handsome return to the owner.

The up-to-date farmer and his sons long ago decided to head his herd with a purebred sire; and only the best bred animals available are used on the farm. Why not follow their example and introduce to the poultry flock a purebred utility bird, or purchase some purebred day-old chicks and thus eventually own a flock of fowls to be proud of? It is unwise to keep more than one variety of fowls, and once your mind is made up as to what variety to keep, stick to it. If Leghorns or Orpingtons, or any other sort, stick to it. You will always do better with one breed than with two.

A question well worth considering is first crosses. Certain crosses make excellent table birds, and lay as many eggs as the purebred birds; the young cockerels always fetch a much higher price than the cockerels of the lighter breeds.

To get a handsome return for your poultry, proper methods of feeding should be adopted. The up-to-date poultry keeper finds that the only way to make poultry pay is to feed a balanced ration—that is, a certain amount of food daily which contains all that is necessary to keep each bird in perfect health, also to give her the necessary materials for egg production. A flock of good quality utility stock should give an average of 180 eggs per bird per annum; many flocks average much higher than this. Birds laying 180 every year would show a handsome profit after providing for the cost of food. Let us consider the profit on feeding 100 birds fed on a prepared laying mash, such as Denham's "X.L.N.T." which is specially prepared for fowls on free range and not confined to intensive houses. One hundred birds would require 12½ lb. of this mash daily, costing 7s. per week; the birds on free range will pick up during the day any amount of green stuff and would only require about 2 oz. of grain before going to their roost; a plentiful supply of clean water in a shady place must be provided, and shell grit must always be available. The return from 100 birds laying on an average 180 eggs each per annum, selling at an average price of 1s. per dozen, works out at £1 10s. per week. Is there anything on the farm that yields anything like so handsome a return for money spent on feed? A net profit of £1 3s. a week over cost of the laying mash would help to get the many things so much needed in the household, and the pleasure derived from keeping such a flock of birds is inestimable. Denhams Limited—manufacturers of the famous "D in diamond" Laying Mash, and "X.L.N.T." Laying Mash invite you to call and see the care used in the manufacture of all their stock foods, and any problem in connection with the care and feeding of live stock will receive their careful attention.

FLOWERING SHRUBS.

Lagerstrœmia indica varieties.—There are many beautiful forms of this shrub on the market, and the finest varieties have been raised in Queensland—*L. Matthewsii* and *L. Earesiana*; the colours of both are lilac, but *Matthewsii* is the darker shade. The heads of bloom of both varieties attained a length of about 24 in., and the individual flowers are a couple of inches across. The plant may be grown in any small garden, and the size may be kept at the will of the gardener. Specimens growing in Brisbane range from a few feet high to 20 feet.

The plant stands severe trimming; in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river side of the Customs House garden. Plants are easily raised from cuttings taken from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

Gardenias.—In the earlier days of Brisbane there were few gardens without a gardenia; now they are rarely seen. *G. Thunbergii* is one of the varieties that should be grown. The flowers are pure white, exquisitely scented, and the foliage of all the varieties are a glossy green. These plants are not too fond of pruning, and should be allowed to grow in their own way. *Gardenia florida* is mostly grown

for florists' use, the flowers being perfect in form and not having the heavy perfume of the other varieties. All the gardenia family are subject to scale diseases, but are easily kept clean by occasional sprayings with boiler water that has plenty of soap in solution. The plants never attain any size, so are very useful in small gardens.

Oleander.—In the northern part of the State these plants flourish, and are much admired by visitors from the Southern States and overseas.

The plants attain a fair size if not kept within bounds. In some of our northern towns it is quite common to see plants 20 to 30 feet high, and of many colours. The plants are grown in Brisbane, but by a few only, yet they grow just as well here as in the North. The smaller growing varieties should be more extensively grown, and the pink "Carnea," white "Madonna," and carmine "Delphine" are all good old varieties.

When growing the plants in small gardens it is necessary from their earliest stages of growth to keep them well headed back, the young wood of the previous year being the flowering wood.

Lantana.—The small varieties of lantana are not in common with the pest scattered all over Queensland, and are very beautiful when trained as hedges or shrubs. The tangerine-coloured variety and the canary-yellow variety are the two usually grown in Southern Queensland. Splendid specimens of these are growing in the Botanic and Museum gardens. The plants flower for nine months of the year, and will grow in almost any soil and will stand fairly hard conditions.

LANDSCAPE GARDENING.

The landscape gardener must possess a good deal of artistic taste, as he deals with the landscape and its improvement. Should alterations be necessary, they must be carried out in as natural a manner as possible, and they must be in unison with the surrounding country. Any existing natural features may be made the most of.

If trees shut out a desirable view, they may with care be removed. Tree thinning also becomes necessary when some are spoiling others. It is better to have one good specimen than several poor ones. When tree planting, the gardener must look forward, and consider their size when maturity is reached.

Broad stretches of lawn may be broken up with shrubs or specimen trees, or beds of flowers. The character of the soil and the situation must be taken into consideration when planting. It is of no use to plant trees or shrubs that are not likely to succeed, and if doubtful ones are included they must be in positions where they can be easily replaced should they fail. The character of the dwelling must also be taken into consideration.

Vista making is an important part of landscape gardening, and to carry it out the various points of vantage have to be ascertained and their values determined. The outline of the landscape from the various vantage points must be undulating, not straight or unbroken, and though special hues in greenery may be made the most of, they must not be repeated until the eye wearies of them.

Paths should be as few as possible, and each should be made for some definite purpose. They should run in bold but graceful curves, especially when made of gravel.

If summer houses are included they should not stand out aggressively, and they should be covered with creepers as quickly as possible.

PROPAGATION BY CUTTINGS AND LEAVES.

The herbaceous character and free-growing nature of the majority of plants that are used for summer bedding renders their propagation easy. Large numbers of plants are required in as short a time as possible, and without the expenditure of much time or labour, and unless a plant is easily propagated it is of little value in the bedding department.

Autumn propagation is preferred for the more robust of these plants, cuttings at that time being both plentiful and vigorous and the season favourable for the quick production of roots. If the necessary preparation of beds, boxes, and soil has been

attended to, the whole of the cuttings may be put in during autumn and rooted before the cold weather comes. It may be laid down as a general rule that all stout, free-growing cuttings prefer a strong loamy soil, while those of a more delicate nature and that have fewer roots are safest when planted in light sandy soil containing a large proportion of leaf mould.

The cuttings should be planted firmly, in rows about 6 inches apart, and should receive a good watering as soon as planted, after which they will require little attention beyond the removal of dead leaves and a sprinkling of water overhead should the weather be dry. As soon as rooted, or at least before the approach of the cold, wet weather, they should be placed in boxes, pans, or pots, in which they are to winter. For smaller quantities it will be found best to plant the cuttings in shallow boxes, in which they may be allowed to remain until the spring.

Pentstemons, phloxes, pinks, antirrhinums, and a host of other bedding plants of robust constitution may be increased in the autumn in this way. Boxes are most convenient for these purposes. The bottom should be pierced with several holes an inch or more in diameter, and covered with an inch of ashes or crocks as drainage, the box being then filled with sandy soil, using loam, leaf mould, or whatever mixture the nature of the cuttings would require.

Under certain conditions buds are formed on the leaves of a large number of plants, such buds being called adventitious, to distinguish them from the stem or normal buds, which are found on all plants, and which are borne in the axils of the leaves. It is supposed that the leaves of a very large proportion of plants possess this power to develop extraordinary buds, and that their failing to do so when tested by the gardener is due to improper treatment rather than to absolute impotence in the leaf itself.

It is, however, only in a few cases that leaf-cuttings are resorted to for purposes of propagation. Such plants as begonias, gloxinias, and a few others of more or less succulent nature are the only ones for the increase of which leaf-cuttings are employed. Numerous other plants have proved capable of propagation by this means, some of them being not at all succulent-leaved, while on the other hand, plants of excessive succulence have proved unable to form buds when tested in the same way. In some cases where leaf-cuttings have been tried, roots were freely developed but no bud was formed. Camellias may be mentioned as plants whose leaves root freely but do not develop buds, although left in the propagating house for several years.

Where it is desirable that a new plant should be propagated as abundantly and as rapidly as possible, it will be found often advantageous to place the leaves that are removed from stem cuttings in the propagating frame and treat as advised below. To anyone acquainted with the nature of the following list of plants, it will be apparent that no rule can be laid down for the guidance of the cultivator, either when based on the texture of the leaves or the nature of the plants. Begonias, clianthus, gesnera, gloxinia, hoya, lilium, watercress, and many others may be propagated by means of leaves or portions of leaves.

Turning now to the plants that are usually increased from cuttings made of leaves, a word may be said on the treatment such leaves require, and the best time of the year for the operation. Gloxinias may be dealt with all times of the year when leaves are available, the most favourable period being autumn. Well-matured leaves should be selected, avoiding those in which the yellowness of decay has appeared. The leaf-stalk may be severed at any point, it being unnecessary to secure them with heel or portion of the stem. The blade may then be divided longitudinally, so that a large leaf would form about half a dozen cuttings. It is, however, better when the blade is cut into sections, each section having a portion of the midrib attached to its base.

Some prefer severing the midrib into about a dozen pieces, leaving the blade intact. In this way a plant is obtained from each portion of the midrib, bulbils being developed on the lower end of each. Where the latter plan is adopted the whole leaf must be pegged on to a pan of sandy soil. If the leaf is divided up into smaller pieces, pots may be used, filling the pots half-full of drainage, and the other half with a light sandy soil. Into this the cuttings must be placed obliquely, so that whilst held firmly in the soil their bases are only a little below the surface. A frame in a propagating house will be the most suitable place for the cuttings till rooted. In a small bush-house a position on a shelf would answer equally well for gloxinia cuttings.

Begonias may be treated as suggested for gloxinias; or, if to be propagated on a large scale, a frame containing cocoanut fibre may be used, pegging the begonia leaves on to the fibre.

Reference may be made to the reproductive nature of some fern fronds, especially the aspdeniums, nephrodiums, aspidiums, the fronds of which usually bear buds, which eventually form plants. The requirements of such leaves, when wanted for propagating purposes, are very much the same as those of the plants themselves.

The scales which form lilium bulbs may be used for propagation, as if fresh when gathered and placed in sandy soil they root and form small bulbs capable of growing into large plants. All these exceptional ways of obtaining a stock of plants are only resorted to in exceptional cases; they are chiefly of physiological interest, showing as they do how nature has provided plants with auxiliary powers for their reproduction, which are held in reserve till called upon by the failure of the normal proper means to fulfil the functions of increase or reproduction.

CLIMBING ROSES.

By S. B. WATKINS, President, Horticultural Society of Queensland.

AMONG climbing roses are included all roses other than the typical dwarf varieties, which are the most usual kinds found in our gardens. In the broadest sense of the term, then, the following classes are covered:—Normal climbers and the climbing sports of many well known dwarf varieties; climbing multiflora and certain extra vigorous sports from the dwarf multifloras; the wichurianas and ramblers; and certain rose species and closely related forms. Among this great array we have roses for almost every purpose outside the every-day garden dwarfs. Roses to put over trellises, arches, and pergolas; roses to cover fences, banks, and stumps; roses to run over dead trees and unsightly objects; roses to make bold splashes of colour in landscape work and impressive masses in odd corners. With such a variety at command, it would be possible by careful selection and judicious planting to develop a rose garden akin to the famous bougainvillea gardens of Mr. Thomas, at Indooroopilly.

The usual criticism levelled at the climbing rose is the question of room required for its development. This criticism is well founded in certain cases, but there are many climbers which can be grown successfully in any garden if careful selection and thoughtful treatment be given to the problem. Again, rosarians ofttimes object to climbers being shy in bloom and spasmodic in effect. Here again much can be done to overcome this fault. On the other hand, place against these objections the following advantages and the climbing rose will surely have claim to more consideration than is usual:

Firstly, climbers need less attention than dwarfs. They grow under much less favourable conditions of soil and situation; they withstand adversity more easily, particularly drought, and they resist disease better than the dwarf varieties. Their blooms are always more perfect in form and larger in size, for which reasons they are worthy of the best attention of exhibitors. Among climbers, blooms of every type are to be had from perfect singles in every shade through the derivatives to the most perfect of exhibition types. Cluster roses and polyantha types are also very common and in many cases the heads of bloom are enormous.

Many weak dwarf varieties have sported climbers of much greater relative vigour than their dwarf parents, as, for example, climbing Mrs. W. J. Grant (Belle Seibrecht), climbing Liberty, climbing Madame Edouard Herriot, and climbing Madame Segond Weber. In these cases it is better to select the climbers and treat as dwarfs by shortening back the heavy growths and inducing lateral growth with its resulting bloom.

In a few cases the climbing sports of weak dwarfs have inherited in some unknown way an extra vigorous constitution and are comparable in strength to the normal climbers. Such is the case with Perle des Jardines, Sunburst, Devoniensis, Mrs. Aaron Ward, and Paul Lede, besides many sports from the Pernetiana roses.

Mention of the climbing sports of Pernetiana roses is of particular interest to Queenslanders. This family of roses is not at home under Queensland conditions. In practically every case these roses are weak growers, much subject to "die back." Some will remember the delight with which Dame Edith Helen was hailed. More potent have been the regrets which have followed the course of "die back" in this rose, until to-day very few can boast of any real success with it. To-day, many dwarf pernetianas have sported climbing forms, and it is gratifying to find that the inherent weakness of the parent seems to have disappeared. I have climbing Madame Edouard Herriot treated as a dwarf. Climbing Los Angeles, climbing

Souvenir de George Pernet, climbing Souvenir de Claudius Pernet, climbing Golden Emblem, and climbing William Kordes, and they are at present healthy vigorous climbers, and in cases where blooms have been produced they have been of very fine quality.

Training the Climber.

The training of climbing roses is of great importance, particularly with respect to obtaining an adequate supply of blooms. Where growing the less vigorous climbers as dwarfs, it is necessary to encourage first lateral growth, as this is the growth on these roses which produces the blooms. By topping back the main shoots to about one-third of their ultimate length, lateral growth is encouraged and blooms will develop. Roses which can be so treated are climbing Liberty, climbing Geo. Schwartz, climbing Mrs. W. J. Grant or Belle Seibrecht, climbing La France, climbing Madame S. Weber, climbing Madame Edouard Herriot, climbing Chateau de Clos Vougeot, and climbing Hoosier Beauty.

In the case of the more vigorous climbers the blooms usually form on the second laterals, and the treatment given should encourage this growth. The long vigorous sappy basal shoots should be trained into as nearly a horizontal position as possible, care being taken not to break them from their base. These shoots man attain a length or from 12 to 20 feet or more. They require topping back to about two-thirds their mature length and securely fastening as close to the ground as possible. Very soon the first laterals will develop from the top eyes and these can be trained outwards and upwards at about 30 to 45 degrees to the main stem, and in their turn topped back to about half their maximum length, depending upon the structure against which they are grown. The blooms will develop upon the next growths, which are the second laterals, and the treatment advised will do much to encourage the development of this blooming wood. The art of securing blooms on climbing roses of this type consists in a suppression of the primary and first lateral growths to encourage good second laterals. Subsequent basal growth can be either tied down if room permits, or excised if the plant is carrying sufficient wood; judicious stopping is required with climbers, otherwise they will develop heavy growth and little bloom. It must be remembered that the majority of climbers in this section need about two to three years to establish the wood from which the real blooms come. Once established the rose will bloom periodically, and it is only necessary to cut the blooms close to the point where they leave the first laterals, and further blooms will develop in their turn.

If a high trellis, say, 6 to 7 feet, is used, or an extension above the usual fence height is constructed, a variation may be made. The heavy basal growths may be carried towards the top at an angle of 45 degrees and securely tied, with the necessary topping depending upon the proportions of the structure. First laterals may be tied securely in a horizontal position as they develop and shortened according to one's taste. Subsequent growths produce the blooms and by establishing a sound foundation of primary and secondary growths the blooms will develop in their turn.

Roses best treated in the way advised are:—Miss Marion Manifold, Countess of Stradbroke, climbing Madame Segond Weber, climbing Sunburst, climbing Madame Abel Chatenay, climbing Columbia, climbing Laurent Carle, climbing Lady Hillingdon, climbing Ophelia, climbing Radiance, climbing Golden Ophelia, climbing Mrs. H. Stevens, Sachsengruss, climbing General MacArthur, Souvenir de L. Viennot, climbing Perle des Jardines, climbing Irish Fireflame, climbing J. J. L. Mock, climbing Mrs. Aaron Ward, and several others found in the climbing lists.

Of those mentioned, I consider climbing Laurent Carle, Mrs. M. Manifold, climbing Columbia, climbing Madame Abel Chatenay, climbing Madame S. Weber, climbing Sunburst, climbing Mrs. H. Stevens, climbing Ophelia, climbing General MacArthur, and Sachsengruss are all worthy of interest.

Among the normal climbing varieties are a number of roses whose vigour defies all attempts to keep them within reasonable bounds. Such varieties should not be grown in small gardens without some knowledge concerning them. I refer particularly to climbing White Mamon Cochet, climbing Mamon Cochet (less vigorous than the white sport), Lady Waterlow, Black Boy, climbing Mrs. G. Shawyer, and climbing Devoniensis. The only place to grow these varieties is out in the open where they have plenty of room to develop. Any attempts at checking their robust habit is resented by these varieties, and they reply by pushing their growth even more strongly than before. Left to themselves they develop into very large bushes and carry in their own time hundreds of blooms which make them a striking feature in landscape gardening.

Covering Arches, Trellises, and Pergolas.

In covering arches, trellises, and pergolas, many people make mistakes in the selection of suitable roses for this purpose. The general class of climbing rose is not a suitable subject. Firstly, the absence of foliage on the lower parts of the growth is a disadvantage, and again these roses develop a growth which is not suitable to the purpose. As already mentioned, normal climbers require a definite treatment to secure success. The heavy growths require to be tied down and the structures referred to do not suit this requirement. Moreover, the lack of flexibility of the canes is against any considerable degree of intertwining. Fortunately, among the climbing Multiflora and Wichuriana classes are roses suitable to this purpose. One of the best is a German variety, Tausendschon (Thousand Beauties) sent out by Schmidt in 1906. This rose is a beautiful deep pink when it opens in the cold weather, but in Queensland it is usually paler; but even with this bleaching the rose remains a gem. It clothes itself from base to top with good foliage, and its canes and subsidiary growths can be trained perfectly to the structure on which it is growing. Mrs. F. W. Flight is another lovely pink variety suitable to this purpose, and produces the largest truss of any cluster rose I know. The Beacon also is a fine red variety suitable in this class.

In cases where trellises are very long or where lattice work on a house requires a good covering, the Wichuriana roses serve the purpose. Their extra long canes can be twisted in all directions and into all shapes. Whilst there are many people who favour the well-known Wichuriana, Dorothy Perkins, it has a number of disadvantages. It is not always certain in bloom, it mildews, and as a result loses its foliage, and it requires much patience and perseverance to train it as the long canes grow quickly. Varieties much more suitable are to be found in the following selection:—

American Pillar, a beautiful single pink with a white eye not nearly as rampant as many of this class, and more easily trained. It requires time to establish itself.

Excelsa, a rather vigorous variety carrying huge heads of a beautiful bright red colour. It is sure to bloom every year and is a very desirable variety in every way.

Heart of Gold, a moderate grower with an unusual coloured blossom. It is a deep crimson single rose with a white eye relieved by a beautiful aureole of deep golden yellow stamens, hence its name.

Ile de France, a robust Wichuriana of recent introduction giving large trusses of a good red colour.

Romeo, the best of all in my experience, but almost too rampant for general purposes. It is a fine, deep-red flower in huge free clusters. It is most suitable where room is no object, on a bank or slope or over an old stump or tree.

These varieties, together with others of this class, are suitable for covering such unsightly objects as banks of rock, old dead trees, and difficult slopes. They can also be used to create bold masses in the garden and, in my own case, I have Romeo on a flat trellis which is about 3 feet off the ground and some 400 feet square. The long canes lie flat on this structure, and in this position they carry their beautiful blooms well above the foliage as a carpet of glowing red (a rather thorny, rough carpet). This method of training has the one disadvantage that the blooms are difficult to pick, and much ingenuity is required to reach the blooms. In creating further bold masses, many of the species or closely related varieties are deserving of attention. Among these stands Mermaid, a hybrid of Rosa Bracteata. This rose is an extra vigorous, extra thorny variety which is best left entirely to itself. Its deep yellow, single flowers are borne in clusters and, though only lasting a day, individually the clusters are effective for over a week, as individual blooms open each day. Moreover, the fallen petals leave a halo of yellow stamens which in no way detract from the beauty of the cluster. A vase of these clusters lasts many days, as the unopen buds develop in water just as well as on the tree. In this class are the Cherokie roses (Rosa Laevigata) known under the names of Sinica Alba, Sinica Anemone, and Romona. These develop into large, massive bushes under our conditions, and are covered completely by their respective blooms in the spring of each year. Then they are a sight never to be forgotten.

In conclusion, I would like to comment briefly on extra large bush roses, which are usually classified as climbers. The outstanding variety here is climbing Madame Cecil Brunner, which grown in the open develops into a large, symmetrical bush and, in its time, carries huge sprays of the most perfect miniature roses. It is a gem, and does very well when left to itself. Another rose which may be grown as a large bush is the Wichuriana, Dr. Huey. It does not possess the long, flexible canes

of its class, but develops long, arching canes which form the foundation for subsequent growth. This growth clothes itself with a profusion of deep, rich, red, semi-single roses of rare beauty. Paul's Scarlet Climber behaves similarly, and is a fine sight when covered with its bright scarlet bloom.

ONION BED.

It may be looking well ahead, but the onion bed for the next season should be prepared now. Onions require a deep soil—one where the roots can go well down; at the same time it should be firm. The consequence is that if trenching or deep digging is done, it should be done so that the ground can settle and get consolidated before the crop is planted or sown in spring. A good soil is required, but a soil heavily manured with stable manure will produce a large, bulky, but soft bulb that does not keep well. Potash is one ingredient that is absolutely necessary, and for this reason all ashes from wood and rubbish heaps should be scattered on the ground where the onion bed is to be. This can be done during the winter, as the soil holds the potash and does not leach out, as is the case with nitrogen.

KITCHEN GARDEN.

Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnips, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top-dressing, where vegetables have been planted out with fine stable manure, has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

TRANSPLANTING FRUIT TREES.

The transplanting of partially developed fruit trees is seldom attempted on account of the risk of failure and the trouble entailed in endeavouring to retain sufficient fibrous roots to ensure a reasonable prospect of success. Trees up to five or six years old, where subject to the necessary preliminary treatment, can not only be removed without risk of failure, but transported satisfactorily over long distances. It will be recognised that the sustenance of the plant is absorbed by the small or fibrous roots in the immediate vicinity of their terminals, and by inducing a profusion of these within a short radius of the stem the chances of failure are practicaly nil. A profusion of small roots may be ensured by cutting through at the desired distance from the stem (15 to 24 inches, according to the size of the tree) all roots to a depth of 18 inches. In so doing a trench is made around the tree, and the ends of roots carefully pared if the cutting has not been "clean." The trench is then refilled with soil containing a good supply of humus, and in about three months' time the original root ends will have developed a good supply of fibres. At the time of removal these are not interfered with more than can be avoided, the necessary excavation for removing the tree from its original position and severance of any lower roots being made beyond the terminals of the young root growth. The head of a large tree should be materially shortened at the time of removal. The cutting of roots in the first instance should be performed when the tree is in a dormant state; in the case of citrus, conditions are generally favourable about March. Tropical varieties handled in this manner can be removed at almost any time after sufficient roots have formed and hardened, and may be first treated at any time of the year at the period known as "between growths."—GEO. WILLIAMS, Director of Fruit Culture.

Farm Notes for August.

Land which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour, will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before rebagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this month in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

Orchard Notes for August.

THE COASTAL DISTRICTS.

The bulk of citrus fruits, with the exception of late ripening varieties, will now have been marketed, and cultural operations, pruning, spraying, &c., should be receiving attention. Where trees show indication of impaired vigour, pruning should be heavy, both in respect of thinning and shortening branches. Where trees are vigorous and healthy a light thinning only will be necessary, except in the case of the Glen Retreat Mandarin, which in coastal lands is invariably disposed to produce a profusion of branches with consequent overproduction and weakening of the constitution of the tree in addition to the fruit being small and not of the best quality. Where white louse is present on the main stem (where it almost invariably makes its first appearance) or branches, spraying with lime sulphur solution in the proportion of one part of the concentrate to ten parts of water after the centre of the tree has been opened up by pruning will be found most beneficial.

In dealing with trees which show signs of failing, investigation should be made near the ground level for indications of collar rot, and in the North Coast district particularly, for the presence of the weevil root-borer which may attack the roots in the vicinity of the thin bases or at some feet distant. A very light application of paradichlor. buried a few inches under the soil in circles around the tree and the surface tamped firm is considered efficacious in destroying the pest. The distance between the circles (shallow openings connected throughout) should not be more than 18 inches. It may be necessary to repeat the application at three to four weeks' intervals.

Spraying with Bordeaux mixture is desirable as it will, if properly applied, destroy the spores of various fungi later attacking both foliage and fruit.

Where for any reason healthy trees of vigorous constitution are unprofitable they should now be headed back—in fact, the whole of the top removed, leaving only a few selected ''arms'' of previous branches, all other branches being cut clean away at their base. Three or four main arms, whose length will vary from 2 to 4 feet according to the size of the tree, will form the future head of the tree, and from

these numerous shoots will originate; these shoots in turn are reduced according to circumstances, usually from two to five on each arm, and given fair attention they will be in a fit condition to receive selected buds from a prolific tree by next autumn. It is advisable when the shoots intended for budding have attained a length of about 6 inches to nip off their terminals for the purpose of stiffening their growth, otherwise they are liable to be blown off by winds. All branches or parts removed in pruning should be carefully collected and burned. Applications against pests and disease could hardly be satisfactory if the material for reinfestation is available throughout the orchard.

Working the land is essential, and disc implements give best results. Before ploughing it is advisable to apply the necessary fertiliser, not just around the trees beneath their branches, but over the whole orchard, the feeding roots mainly extending beyond the extremities of the branches. The depth to which ploughing should be effected will depend on the nature of the soil and its original preparation. Where the subsoil is of a permeable nature, or has been broken up in the first instance, ploughing could be much deeper than on land where due consideration had not been given to this practice. It will also be noted that among some of our light loams that fertility is confined to a shallow depth, where it would be futile to persist in deep ploughing to force the roots into a subsoil from which they could derive but little sustenance. Following upon ploughing, the soil should be further treated until finely broken; the implement necessary will depend upon the constituency of the soil. Generally a good harrow will meet all requiremnts. On the completion of ploughing between rows an open furrow should not be left on the border or margin, but two or three furrows should be turned back to fill this and the whole then worked sufficiently to leave an even surface throughout the orchard. Except for the purpose of turning in fertilizer or green manure, a good type of disc cultivator can be substituted for the plough and will give at least an equal result.

The planting of trees may be continued and with the exception of custard apples (which should be left until the end of August) should be expedited. The attention of citrus growers should be confined mainly to good varieties like Jaffa and Siletta, with a lesser quantity of late Valencia. The preserving of orange juice will very materially assist in the absorption of our crop, and the fact that the trees develop much more rapidly in this State than in Southern producing regions is distinctly in our favour; also our fruit contains a much higher sugar content. This, however, is not to be accepted as an invitation to continue the practice of sending immature fruit to the Southern markets.

Grape vines should be pruned, and where cuttings for planting are required these should be selected, trimmed, and heeled in slightly damp soil. Canes intended for cuttings should not be allowed to lie about and dry out, but treated the day they are severed from the plant. Cuttings are frequently made of excessive length. Ten to twelve inches is a fair length, allowing for insertion in the soil to admit of the top bud with a short section of the internode to protrude. Growth is only desired from the upper or exposed bud.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. The time is opportune (when there is indication of the buds swelling) to work over (where the stock is reasonably vigorous) unprofitable trees. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

Late spraying against San José scale where present should be applied with an efficient oil emulsion before any growth appears. Each particular brand has its advocates. Where the scale is persistent, a 2 per cent. solution of Volck may be applied subsequent to the appearance of foliage. Both of these sprays are efficacious against peach or other aphis at a much reduced strength. One per cent. has given satisfactory results. The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and if any effort is being made towards raising a local supply of nursery stock.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

Date.	July, 1931. Rises.	July, 1931. Sets.	August, 1931. Rises.	August, 1931. Sets.	Moonrise. July, 1931. Rises.	Moonrise. Aug., 1931. Rises.
					p.m.	p.m.
1	6.48	5.3	6.38	5.18	6.9	7.47
2	6.48	5.3	6.38	5.18	7.7	8.38
3	6.48	5.3	6.37	5.19	8.4	9.30
4	6.48	5.3	6.37	5.19	9.3	10.21
5	6.48	5.4	6.36	5.20	9.55	11.15
6	6.48	5.4	6.35	5.20	10.50	...
						a.m.
7	6.48	5.4	6.35	5.21	11.37	12.11
8	6.48	5.4	6.34	5.22	...	1.8
					a.m.	
9	6.47	5.5	6 33	5.22	12.29	2.7
10	6.47	5.5	6.32	5.23	1.24	3.5
11	6.47	5.6	6.31	5.23	2.22	4.7
12	6.47	5.7	6.30	5.24	3.22	5.5
13	6.46	5.7	6.29	5.24	4.22	5.58
14	6.46	5.8	6.28	5.25	5.22	6.45
15	6.46	5.9	6.27	5.25	6.23	7.23
16	6.46	5.9	6.26	5.26	7.19	7.58
17	6.45	5.10	6.26	5.26	8.8	8.23
18	6.45	5.10	6.25	5.27	8.50	9.7
19	6.45	5.11	6.24	5.27	9.25	9.41
20	6.44	5.11	6.23	5.28	9.59	10.19
21	6.44	5.12	6.22	5.28	10.32	11.6
22	6.44	5.12	6.21	5.29	11.5	11.57
						p.m.
23	6.43	5.13	6.20	5.29	11.43	12.54
					p.m.	
24	6.43	5.13	6.19	5.30	12.22	1.52
25	6.42	5.14	6.18	5.30	1.9	2.50
26	6.42	5.14	6.17	5.31	2.3	3.47
27	6.41	5.15	6.16	5.31	3.1	4.47
28	6.41	5.15	6.15	5.32	3.58	5.43
29	6.40	5.16	6.14	5.33	4.56	6.32
30	6.40	5.16	6.13	5.33	5.46	7.25
31	6 39	5.17	6.12	5·34	6.39	8.15

Phases of the Moon, Occultations, &c.

8 July	☽	Last Quarter	9 51 a.m.
15 ,,	●	New Moon	10 50 p.m.
22 ,,	☾	First Quarter	3 16 p.m.
29 ,,	○	Full Moon	10 47 p.m.

Apogee, 7th July, at 12.30 a.m.
Perigee, 18th July, at 10.24 p.m.

On the 28th, about 6 p.m., the apparently very close proximity of Mercury to the bright star Regulus in Leo, above the western horizon, will form a very interesting spectacle for all observers with or without telescope or field glasses. The combination of a planet with a fixed star of the first magnitude is uncommon, and will afford a fine opportunity to make sure of the elusive planet Mercury.

On the 1st of July Mercury will set 5 minutes later than the Sun, and 1 hour 12 minutes later on the 15th, at Warwick.

Venus will rise at 5.45 a.m. on the 1st, and at 5·38 a.m. on the 15th.

Mars will rise at 10.32 a.m., and set at 9.53 p.m. on the 1st; on the 15th it will rise at 9.58 a.m. and set at 9.35 p.m.

Jupiter will rise at 8.3 a.m. and set at 6.26 p.m. on the 1st; on the 15th it will rise at 7.20 a.m. and set at 5.36 p.m.

Saturn will rise at 6.3 p.m. and set at 7·38 a.m. on the 1st; on the 15th it will rise at 5.1 p.m. and set at 6.40 a.m.

The Southern Cross will be erect about 5 p.m. on 15th July, and will reach the horizontal position, represented by III. on the clock face, about 11 p.m.

An article on "The Usefulness of the Southern Cross," with a diagram, was published in the "Queenslander," 14th May.

---

7 Aug.	☽	Last Quarter	2 28 a.m.
14 ,,	●	New Moon	6 27 a.m.
20 ,,	☾	First Quarter	9 36 p.m.
28 ,,	○	Full Moon	1 10 p.m.

Apogee, 3rd August, 5.48 p.m., and 31st August, 7.24 a.m.
Perigee, 15th August, 7.54 p.m.

After sunset, on 1st August, the two brightest objects to first become visible near the western horizon will be Regulus and Mercury. Regulus will disappear at 6.54, then Mercury at 7.17. Neptune will also be in the immediate neighbourhood, or apparently so, but will require optical aid to make it visible. Mercury will be passing from west to east of a line joining the Earth and Neptune in the early morning of the 2nd.

If it were not for their nearness to the Sun the two brightest planets, Venus and Jupiter, would appear to be very close together, especially before sunrise on the 7th. These two planets will be up all day, and, setting shortly before the Sun, will be entirely absent from the evening sky. By the end of the month these planets will be widely separated by an apparent distance not far short of four times the length of the Southern Cross; Jupiter will then be the finest morning star.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/- including postage.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXVI. 1 AUGUST, 1931. PART 2.

Event and Comment.

The Governor's Speech.

INTERESTING references to rural industries in the State were made by His Excellency the Governor, Lieutenant-General Sir John Goodwin, in the course of his speech at the opening of the fourth session of the Twenty-fifth Queensland Parliament. Commenting on the increase in land occupation, he said that the Upper Burnett and Callide Settlement had been placed on a firm footing, about 1,400 new settlers having thus been added to the primary producers of the State. Pioneer access roads in that area, totalling 847 miles in length and involving the building of twenty-three bridges, had already been constructed. Water facilities had also been provided for the settlers by the Government. The pastoral industry had also benefited by a wise policy that had already resulted in a very large saving to landholders. Referring to the present revival of interest in the tobacco industry, His Excellency said that the first year's returns from the Mareeba settlement were distinctly encouraging. Notwithstanding the fact that the season in that region was the driest for fifteen years, and only half the normal rainfall was recorded, good payable crops were obtained. Tobacco growing, which is expected to soon develop into one of

our more important staple industries, was being given every practical encouragement that our scientific and technical services could devise. New legislation relating to efforts to eradicate the prickly-pear pest had been actively applied. The first matter to determine was the priority areas that would be granted to existing lessees on infested lands. Seven hundred of these settlers had already intimated their willingness to surrender their existing leases in order to obtain a freehold priority right over a living area, subject to developmental conditions.

Land Settlement and Forestry.

CONTINUING, His Excellency said that it was proposed to undertake a vigorous policy of land settlement and forestry administration in North Queensland. A Royal Commission had been appointed to ascertain the ways in which the progress and development of the tropical North could be encouraged, and a definite land settlement and forestry policy had been framed for the next ten years. The Forestry Board, during the year, had carried out economic inquiries into the state of the timber industry and a conference had been convened, as a result of which the Board was commissioned to assist in the devising of ways and means for the rehabilitation of the trade. In the course of the year the Forest Boundaries Committee had been constituted to examine closely all forest reservations with a view to their permanent demarcation, after full consideration of the claims of other rural interests. That committee had already entered upon its onerous and difficult task. Consideration was also being given to a general developmental forestry plan which would be later submitted to Parliament.

Progress in the Primary Industries.

REVIEWING the general progress in the primary industries of the State, the Governor remarked on the extensive development that had taken place in the Dawson Valley irrigation area in which cotton-growing is firmly established. Last year's output of fibre aggregated 1,460,000 lb., yields up to 1,500 lb. an acre being obtained. The 1930 wheat crop was a record for Queensland, both in acreage and yield. Climatic conditions favoured the dairying industry, and were reflected in a production of over 93,000,000 lb. of butter and 13,000,000 lb. of cheese. Of this quantity, over 70,000,000 lb. of butter and 7,500,000 lb. of cheese were exported. There was every prospect that frozen pork export trade would grow greatly in importance. Steady progress had been maintained both in the quantity of wool produced in individual fleeces and the number of sheep, which at the end of December last amounted to 21,795,899—the highest number recorded since 1914. Referring to the activities of the Pasture Improvement Committee, His Excellency said that its work had already proved that it was possible not only to increase the carrying capacity of coastal pastures, but at the same time to increase the nutritive value of the grasses produced.

"A Very Happy Memory."

HIS Excellency's speech was remarkable for a warm personal note, and he spoke as one who, in the course of his term of office, had made himself acquainted intimately with Queensland and its people. "Provided that affairs of State pursue their normal course," he said, "I assume that this is the last occasion on which I shall have the honour of opening Parliament in Queensland. I think that towards the termination of his period of office it is inevitable that a Governor should view matters in retrospect, and it is also inevitable that he should realise his own limitations and feel regrets for omissions, for errors, for imperfect work in which he has fallen short of those standards and ideals of accomplishment to which he aspired to attain. I have felt, and do feel, such regrets, but in one particular sphere I have none but the very happiest experiences on which to look back, and that this is so is due entirely to you gentlemen of the Legislative Assembly and to your predecessors.

I would express my most sincere appreciation of, and gratitude for, the unfailing and untiring courtesy, patience, consideration, and kindness which I have received from both sides of this House ever since the day on which I had the honour to assume office as Governor. After more than four years I may say that my lines indeed have fallen in pleasant places and that, come what may, I have been blessed in very many ways, and not the least so as regards my relationship with the gentlemen of the Legislative Assembly. I shall always be proud to recollect this happy relationship and to remember that I can number amongst my personal friends gentlemen on both sides of this House. To you and to the people of this State I tender my most sincere gratitude, for to you and to them is due the fact that my term of office will always be for me a very happy memory. Intense appreciation of this State, love for its people and its children, and sincere hopes and prayers for the future progress and prosperity of Queensland and Queenslanders, will be foremost in my heart so long as I live.''

A Northern Asset.

THREE things in particular evidently impressed the Governor, Sir John Goodwin, on his recent tour of North Queensland—the interest evinced in tobacco growing, the recuperative climate of the Atherton Tablelands, and the attractions that the Great Barrier Reef offers to tourists. He returned from his mission inspired by great hopes of the future of the Mareeba tobacco-growing industry. He brought back with him a supply of the bright lemon-coloured leaf in the state in which it was removed from the flue-curing kilns. He declared that it provides an enjoyable smoke. In the course of his tour, which embraced most of the towns up the coast as far as Cairns, His Excellency made a special point of seeing the school children. He actually saw the pupils of no less than ninety-five schools—in several cases the children from several schools were gathered together at one centre. He found generally that the children were of a fine type, both mentally and physically. ''I do not think that the immense importance of the tableland from a health point of view is fully recognised,'' he said. ''Situated in the tropical North, it is a natural sanitorium for those people who can there seek recuperation in an invigorating atmosphere. In this respect the tableland is a tremendous asset to the people of the tropical North. My personal belief in Queensland is unshakeable. . . . .''

Science on the Farm.

STRESS was laid by the Minister for Agriculture and Stock (Hon. Harry F. Walker), at the opening of the Wondai Butter Factory recently, on the necessity of the reduction of farm costs. To achieve this he advocated more consideration for dairy herd improvement. The position facing the farmer was that he had either to make slaves of himself and his family or make use of the facilities provided by his Department for herd-testing and scientific direction in other matters pertaining to rural industry. ''If the dairymen of Queensland could give us a further 10 lb. of butter-fat per cow per year it would mean a tremendous increase in our butter trade,'' pointed out the Minister, who went on to explain that that result could be attained by herd-testing, rotational grazing, the fertilization of pastures, and the wider use of machinery. He felt sure that the butter factories would assist their suppliers in having their cows tested. If Australian farmers could produce another bushel of wheat per acre it would mean an enormous increase in our annual returns, while 1 lb. of wool more on every sheep's back would represent, approximately, an additional £4,000,000 to the Commonwealth annually. If all the cows in Queensland yielded 260 lb. of butter-fat per head per year, it would represent an annual increase in production of the value, at the present price, of £4,500,000. Our dairying returns generally showed that there was ample room for herd improvement. At the present time, said Mr. Walker, Queensland producers were getting the highest prices paid in the world for their products. This went to show that the farmer by organising and stabilising his industry would ensure for himself a living wage, besides adding to the general prosperity.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director of Sugar Experiment Stations.

PART XVII.

(c) Mills and Milling Work—*continued.*

BETTER times were dawning for the Queensland sugar industry though the depression mentioned in the two previous chapters lasted a long time. The proposal that "after the 31st day of December, 1890, no licence to introduce islanders shall be granted," which was carried in Parliament in 1885, was repealed, and planters got a further breathing space for carrying on—that is, as far as cheaper labour was concerned. The elimination of the smaller and less efficient mills gradually took place. More central mills, better equipped, were erected during the 'nineties, and as previously outlined the plantation system began to give way to numbers of small farmers doing their own work and supplying cane to the factories. Many of these men had been labourers, and had naturally a sympathy with their own class, and so they began to employ white labour wherever they could. Gradually, too, the making of white sugars direct for the market was given up and raw sugars were made and sold to the refineries. Labour-saving appliances were introduced from time to time, which helped to cheapen production and manufacture. The industry, of course, had its ups and downs during the 'nineties, owing to being upon the open market, with hostile tariffs against it to a greater or less degree in the other States.

The desire to greatly improve the efficiency and output of the mills then existing may be said to have commenced in earnest when federation was introduced and the Customs barriers were destroyed. Queensland sugar was now to rely on white labour, but it had the whole of Australia for a market. From the period which may be said to have commenced in 1901, steady improvement has been made until we now find our mills manufacturing sugar from less cane than in any other cane sugar country in the world.

For the purposes of comparison, it will be interesting at this stage to show how the large numbers of mills which were listed as operating in the 'eighties had dwindled by 1901, although a few new mills (centrals) had been erected. The following is a list of those mills that had survived up till 1901:—

Above Townsville.—Mossman and Mulgrave, central; Hambledon and Goondi, Colonial Sugar Refining Company; Mourilyan and Ripple Creek, private companies; Victoria and Macknade, Colonial Sugar Refining Company.

Lower Burdekin District and Proserpine.—Kalamia and Pioneer, private companies; Proserpine, central.

Mackay District.—Marian, Racecourse, North Eton, Pleystowe, and Plane Creek, central; Habana, Farleigh, Palmyra, Meadowlands, and Palms, private companies; Homebush, Colonial Sugar Refining Company.

Central District.—Yeppoon, private company.

Bundaberg District.—Qunaba, Bingera, and Fairymead, private companies; Gin Gin, central; Spring Hill, Windermere, Waterview, Sharon, Woondooma, Bellevue, Ashgrove, Miara, Waterloo, Tegege, Bonna, Sunnyside, Pemberton, Ashfield, Annesley, Woodlands, Invicta, and Rocky, private companies.

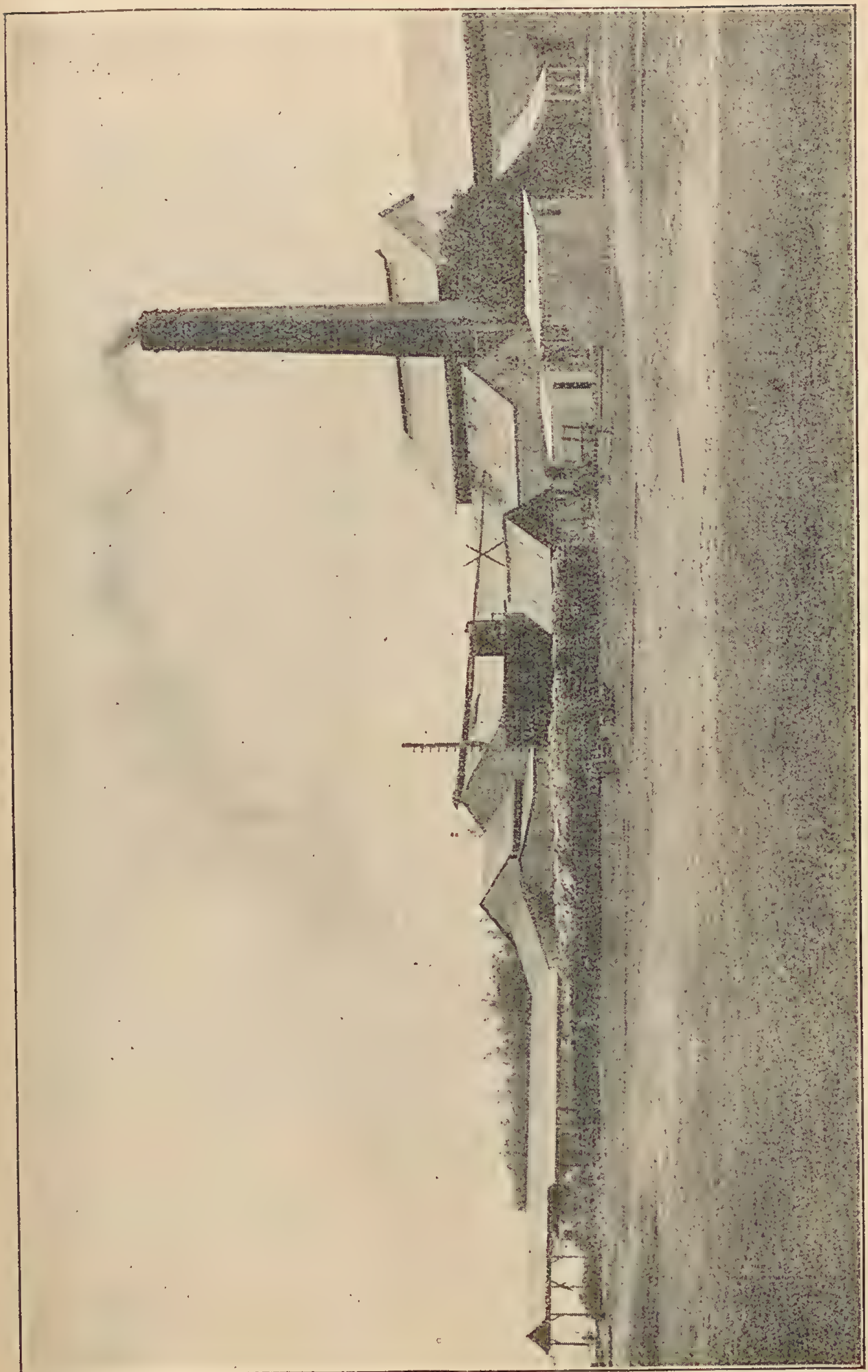


Plate 39.—Old Pleystowe Mill, Mackay, in the 'Nineties.

Maryborough and Isis District.—Childers, Colonial Sugar Refining Company; Isis, central; Doolbi, Knockroe, Goodwood, and Maryborough, privately owned; Mount Bauple, central.

Nambour.—Moreton, central.

Logan and Albert District.—Steiglitz, Eagleby, Carbrook, Alberton, Rocky Point, and Junction, privately owned; Nerang, central; Rosevale and Albert River Milling Company, privately owned.

The above list shows sixty-two mills and it will be seen that there were still a number of small mills existing, principally in the Bundaberg and Logan and Albert districts, most of which were destined to disappear within the next ten or fifteen years. For instance, out of the twenty-two mills shown as still continuing operations in 1901 in the Bundaberg district, only Qunaba, Bingera, Gin Gin, Millaquin, and Fairymead are left to-day, and, although Invicta Mill crushes, it is in a new environment. In that year (1901) the smallest crushing of cane was at the Woondooma Mill, Bundaberg, with 736 tons, and the largest at Hambledon with 74,683 tons. By 1931, the following mills had disappeared:—Ripple Creek, Habana, Palmyra, Meadowlands, Palms, Homebush, Yeppoon, Spring Hill, Windermere, Waterview, Sharon, Woondooma, Bellevue, Ashgrove, Miara, Waterloo, Tegege, Bonna, Sunnyside, Pemberton, Ashfield, Annesley, Woodlands, Rocky, Doolbi, Goodwood, Stegelitz, Carbrook, Junction, Albert River, Rosevale, and Nerang. In the interval between 1901 and 1931, Cattle Creek, Inkerman, Babinda, South Johnstone, and Tully have been erected.

A comparison of the number of mills and the amount of sugar manufactured in 1888 and 1928 is of interest, and is given below:—

Year.	Number of Mills.	Tonnage of Sugar Made.
1888	122	57,960
1928	35	520,620

These figures speak for themselves and show the enormous progress the industry has made in the forty years that have elapsed.

In 1928, which was the record year for the production of sugar, the smallest crushing (excluding the small Beenleigh mills) was at the Maryborough Mill with 22,162 tons of cane, and the largest at Victoria Mill in the Herbert River district, with 252,648 tons of cane. The mill tonnages in 1928, even when compared with the crushings in 1901, will give some idea of the tremendous strides that have been made in mill capacities. For this purpose the tonnage of those mills crushing in 1928 which were also crushing in 1901 are given in the following table:—

Mill.	Tons of Cane Crushed, 1901.	Tons of Cane Crushed, 1928.
Mossman	56,342	78,542
Hambledon	74,683	181,511
Mulgrave	51,429	189,749
Goondi	71,313	173,888
Mourilyan	22,656	161,794
Victoria	65,919	252,648
Macknade	52,535	221,456

Mill.	Tons of Cane Crushed, 1911.	Tons of Cane Crushed, 1928.
Pioneer	68,624	123,864
Kalamia	31,012	159,998
Proserpine	18,682	120,485
Racecourse	25,147	91,350
Farleigh	9,267	92,943
North Eton	15,108	66,216
Marian	27,429	88,387
Pleystowe	21,425	108,995
Plane Creek	26,281	122,425
Qunaba	20,168	43,756
*Millaquin	..	94,980
Bingera	40,708	96,298
Fairymead	44,383	83,581
†Gin Gin (1904)	23,974	30,452
Childers	56,725	82,962
Isis	30,506	88,110
Maryborough	7,368	22,162
Mount Bauple	13,005	24,202
Moreton	9,430	35,364

* Millaquin did not crush cane in 1901; it was then a juice mill and refinery only.

† Gin Gin did not crush in 1901 or 1903, and the crop in 1902 was very small due to the drought, so the tonnage for 1904 has been taken.

Invicta in 1901 was in the Bundaberg district, and its crushing then was 22,734 tons. In 1928, in its new location at Giru, in the Lower Burdekin district, its crushing was 76,494 tons. In the above comparison the small mills operating at Beenleigh have been excluded.

For many years after 1901 there were far too many mills and few of them were supplied with cane to much more than 50 per cent. of their capacity. The Northern sugar-mills had a much better record in this respect than those from Mackay south, but many of these did not get anything like the cane they could crush except during abnormally good seasons. In the Southern districts, drought is far more frequent, frosts often cause considerable damage and reduce yields, and in some localities at that time other crops could be more profitably grown. A Board of Inquiry into the Sugar Industry, which sat in 1916, elucidated the fact that there was at that time sufficient milling power in Queensland to manufacture 355,000 tons of sugar, yet the average production for the fifteen years previous was only 176,000 tons of sugar. One of the reasons was the low price for sugar during the war period, and the ever-growing cost of labour, and it was not till 1920 that the industry began to be treated fairly.

In 1915 the general manager of Central Sugar Mills reported that

> "Large areas of cane land situated adjacent to mills and permanent tramways (constructed at considerable cost) are still lying idle. . . . . It is very unfair to growers who are endeavouring to keep the mills supplied with cane that such lands are allowed to lie idle. Moreover, the mill is faced with increased expenditure in putting down fresh tramlines to tap outside areas to keep up the cane supply, largely because the lands mentioned are not being utilised for the purpose of canegrowing."

He went on to say that the Government were faced with the necessity of heavy expenditure in connection with the Southern sugar-mills to make them efficient. . . . The records show long years of short supplies, and it was his opinion that when the time arrived for

new mills to be established localities within the tropical zone should have first preference and that—

> "the mistakes of the past should be avoided and no mills erected in localities of inadequate rainfall or which are subject to adverse climatic conditions of frost and drought. Already there were some mills erected in the Southern portion of the State under '*The Sugar Works Guarantee Act of* 1893,' which show under present conditions little promise of ever becoming successful business undertakings, and they are an ever-increasing burden to the general taxpayer."

It became generally apparent about 1915 that the sugar industry was being harshly treated in the matter of price. Sugar values were increasing in all parts of the world except Australia. The matter of prices will be dealt with in a later chapter, but it is now sufficient to say that the improvement in the price for Australian sugar made from 1918 on enabled both farmers and millers to get on their feet, and great improvements were introduced into the sugar-mills. In many instances these were completely remodelled and the capacities practically doubled. Growers began to put more land under cultivation, and during the past few years there has been little or no shortage of supply to those mills operating above Townsville. This is due in a measure to the absence of drought conditions in those areas, and also to the completion of the North Coast Railway, which opened up large areas of land hitherto not available.

The following table gives some idea of the great progress the sugar industry has made in the districts north of Townsville since 1916:—

THE DEVELOPMENT OF THE SUGAR INDUSTRY IN DISTRICTS NORTH OF TOWNSVILLE SINCE 1910.

Year.	Locality.	Number of Mills.	Tons of Sugar Produced, 94 net titre.
1910	Above Townsville	7	57,135
	Below Townsville	42	153,621
1913	Above Townsville	7	62,414
	Below Townsville	41	180,423
1916	Above Townsville	9	98,396
	Below Townsville	38	78,577
1919	Above Townsville	9	101,351
	Below Townsville	33	60,785
1922	Above Townsville	9	120,617
	Below Townsville	31	167,618
1923	Above Townsville	9	161,227
	Below Townsville	29	107,948
1924	Above Townsville	9	189,947
	Below Townsville	29	219,189
1925	Above Townsville	10	216,755
	Below Townsville	27	268,830
1926	Above Townsville	10	221,104
	Below Townsville	26	168,168
1927 ..	Above Townsville	10	228,839
	Below Townsville	25	256,906
1928	Above Townsville	10	255,188
	Below Townsville	25	265,432
1929	Above Townsville	10	273,820
	Below Townsville	25	244,696

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

CANE DISEASE IN THE MARYBOROUGH DISTRICT.

The chief disease in the Maryborough district continues to be Fiji disease. Although over the whole area the amount of infection appears to be slightly less than last year, on a number of farms, particularly those situated on the island plantation, the position is still very unsatisfactory. It has been proved over and over again that this disease can be controlled by the simple practice of using disease-free plants and the subsequent rogueing of any diseased stools. If healthy plants are used very little rogueing will be required, and the cost will be negligible. Such growers are therefore urged to obtain their cane for this year's planting from approved sources, and make an effort to eradicate this comparatively readily controllable disease. Fiji disease was recently found on two farms in the Yerra district, and growers in that locality should now be on their guard and be particularly careful in their selection of plants.

The Pialba section is extremely fortunate, inasmuch as, with the exception of Mosaic, there are no major diseases present. In order to preserve this desirable state of affairs it is essential that no cane should be brought into Pialba from outside districts, except under the supervision of an officer of the Bureau. In order to prevent the introduction of Fiji diseased plants from adjoining areas a Proclamation has just been issued declaring the parishes of Maryborough, Bidwell, Tinana, Walliebum, and Young to be a quarantine area. Under the conditions of the Proclamation no cane plants may be sent out from these parishes without the written permission of an inspector under the Diseases in Plants Act. Mosaic is confined to a small number of farms, being serious in those cases, chiefly due to the presence of the variety Shahjahanpur 10, and the growers concerned should obtain their plants from other farms.

In order to assist farmers to obtain suitable cane for planting purposes a list of farmers having such cane is appended. This is not a complete list of the disease-free farms of the district, but merely represents those which have been inspected recently. Any further inquiries regarding cane for plants should be made to the Field Pathologist, Mr. N. L. Kelly, Sugar Experiment Station, Bundaberg:—

S. Seamer, Saltwater Creek; F. C. D. Pohlman, John street North; B. Meyer, The Pocket; F. J. L. Stellmach, Bidwell; O. Wendland, Magnolia; Mrs. E. Leather and R. Johnson, Teddington; J. Philpott and W. Yull, Tinana; A. S. Berthelsen, T. H. Fielding, and C. H. Reiske, Yerra; A. Didgens and P. Petersen, Pialba; C. H. Wilschefsk, Torquay; R. Campbell, F. Christensen, C. Christensen, Mrs. C. Cohen, C. C. Grinstead, H. Jacobsen, M. B. Lawlor, O. Moes, A. Neilsen, C. E. Tench, and G. H. Whittaker, Nikenbah; B. Andersen and E. J. Poacher, Takura.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following Entomological Advice for August from the Northern Entomologist, Mr. E. Jarvis:—

NOTES ON THE TERMITE PROBLEM.

The most destructive "white ant" occurring in our canefields at the present time is the so-called "Giant Termite" of the Lower Burdekin district. Every effort should be made to control the ravages of this pest, which is reported to be locally spreading rather than diminishing.

Damage caused by these insects consists, firstly, in destruction by the worker and soldier forms in the community of newly planted setts and young shoots arising from same; and secondly, of invasion of the basal portion of cane sticks below ground level, followed by ultimate removal of the entire internal cellular tissue of these canes, which are thus reduced to mere hollow tubes, nothing being left excepting the rind.

Common-sense control methods should be practised whenever possible, the first step in this direction being a careful survey of the extent of the infested area, with a view to discovering sources from which invasion may have originated. Such line

of procedure often proves successful where this pest has just made its appearance and not had time to obtain a secure footing. Endeavour to trace as far as possible the path of any tunnels discovered amongst the cane. A stout twig, about 2 feet in length from which the bark has been peeled, will often be found helpful in such work, and enable one to successfully trace a tunnel without risk of losing the course of it through loose ground. Nests of this insect can be destroyed by fumigation with benzine.

Importance of Clean Seed.

During planting operations reject all setts showing indications of tunnelling by beetle or moth-borers. Avoid procuring seed from localities in which either the Giant Termite or the Weevil Borer of cane is known to occur plentifully. It is by means of such diseased seed that the latter insect often obtains a footing in clean canefields and gradually becomes firmly established.

Occurrence of Green Metarrhizium Fungus.

Grubs which are attacked by this insect-destroying vegetable parasite do not decompose, but, retaining their ordinary shape, gradually harden, turning at first white, then olive-green. At this stage of development the body is filled with roots of the fungus, and becoming mummified and of cheese-like consistency can be broken into pieces. Growers would do well to collect all such green, crusted-looking grubs which may be noticed in plough furrows, crush them into powder, and thoroughly mix this with about 100 times the quantity of moist, finely-sifted soil. Such spore-laden earth should then be sprinkled as thinly as possible in furrows when cultivating land known to be grub-infested each season.

Farmers chancing to find specimens of grubs attacked by this vegetable parasite are asked to communicate with the Entomologist at Meringa, as this fungus is wanted for experimental purposes at the laboratory.

GUMMING DISEASE IN THE MORETON DISTRICT.

Owing to the fact that gumming disease is present throughout the Maroochy River area, the control of the disease by means of seed selection among susceptible varieties does not offer any great promise. The Bureau has instituted a system of gumming resistance trials in which all available varieties are being tested for the resistance to this disease. In this connection, a large number of canes have been introduced from abroad, and, in addition, the raising of seedling canes in Queensland is being pushed forward. In 1929 some sixty varieties were planted in trials on the Maroochy River, and on examination at the end of last season the following varieties were found to possess an adequate standard of resistance:—Q. 813, Uba, Chin Chin, B.H. 10/12, S.C. 12/4, H. 227, Co. 210, Co. 213, Co. 227, Oramboo; Korpi, Nanemo, and P.O.J. 2878. In addition three or four Hawaiian canes were held for further tests.

The varieties Q. 813 and Uba are already well known in the district. Some doubt existed among growers as to whether they have the true Q. 813 or not, and consequently an officer of the Bureau was despatched to make a survey of this variety. He reports that the Q. 813 of the Moreton district is the true Q. 813, and, with the exception of a little Q. 1098, this was the only "Q" cane grown.

Chin Chin, B.H. 10/12, S.C. 12/4, and H. 227, while satisfactory from the standpoint of gumming resistance, are poor yielders and cannot be recommended.

The Co. canes have attracted a great deal of attention on account of their vigorous growth and apparent suitability to wet conditions. It must be emphasised, however, that these three varieties have a rather low sugar content, and therefore it would be unwise to plant large areas until their performance on the particular farm has been further studied. In any case they should not be harvested until late in the season.

The three New Guinea canes, Oramboo, Korpi, and Nanemo are canes of good sugar content and should be tried out where possible; of the three, Oramboo appears the most promising.

P.O.J. 2878 has done very well in the very small plantings made to date, and is being propagated as rapidly as possible. It is expected that a distribution will be made next year.

Special mention should be made of the variety P.O.J. 2714 (a bronze-coloured cane). In our Bundaberg trials this variety exhibited pronounced susceptibility to gumming disease, but is more tolerant to the disease under the conditions of higher soil moisture which obtain on the Maroochy River. Nevertheless it has proved definitely susceptible, and it is not expected that this variety will last long. On the other hand it is a most vigorous cane, and provided good seed is available it is thought that it will be justifiable to plant P.O.J. 2714 this year at least, and take the risk of losses due to gumming disease. Any grower who wishes to have any particular source of P.O.J. 2714 inspected before planting is asked to communicate immediately with the Director, Bureau of Sugar Experiment Stations, Brisbane, and arrangements will be made to send an officer to the district.

Quite apart from the use of resistant varieties a very important aspect of the control of gumming disease is the question of drainage. Bad drainage very markedly increases the damage due to gumming disease, and many canes which cannot be grown under present conditions could be cultivated if the drainage were satisfactory.

FERTILIZERS AND THEIR USE.*

By H. W. KERR.

The use of fertilizers is becoming an increasingly important factor in cane production in Queensland. Farmers in all districts have learned that manuring is absolutely essential to successful cane farming, but there are many who have yet to appreciate the value of these materials as an aid in crop production.

There still exists a considerable degree of ignorance regarding the true function of fertilizers in their influence on plant growth. Even farmers who have consistently manured their lands fail to understand just what they are doing when they apply, say, a top dressing of sulphate of ammonia to a crop of ratoons. They know that under favourable conditions the effects on the crop become visible almost immediately, the leaves develop a deep green colour, and the cane puts on a vigorous growth. A frequent explanation is that the sulphate of ammonia acts as a crop "stimulant," but if the use of this stimulant be continued indefinitely, the stage will ultimately be reached when it ceases to produce the desired results. Let us examine briefly the question of plant nutrition, and see how such a theory agrees with the facts which have been revealed by studies in agricultural science.

As recently as the seventeenth century we find a profound degree of uncertainty as to what are the chief factors influencing plant growth. Thus, a careful thinker like Bacon stated as his opinion that water was probably the all-important substance which became elaborated into plant tissues. This view was apparently completely substantiated by the experiments of van Helmont, who grew a willow-tree in a large pot of soil for a period of fifteen years, during which time it was supplied with nothing more than distilled water. Although the plant gained in weight by more than 150 lb., no difference in the weight of soil in the pot could be detected.

Jethro Tull, in 1730, originated the theory that crop roots digested the fine particles of the soil with which they came in contact. As evidence, he showed that intensive tillage resulted in an increased crop, due, as he said, to the production of a greater proportion of fine particles for the nutrition of the plant.

---

* Paper read at the Second Annual Conference of the Queensland Society of Sugar Cane Technologists in March, 1931, and published by permission of the Society.

Further, it was early known that plants contained carbon, for by incomplete combustion of vegetable matter charcoal was readily produced. The value of incorporating animal and plant residues with the soil was also appreciated, so it is not surprising to find the suggestion being advanced that crops fed directly on the soil humus as their source of carbon; and without soil humus there could be no crop.

Much of the confusion which existed was swept away by the brilliant work of a French investigator, de Saussure, during the early years of last century. By conclusive experiments he showed that crops absorbed their carbon entirely through their leaves in the form of carbon dioxide gas gathered from the atmosphere. From the soil the crop received its water supply, and by chemical analysis of plants he showed that the soil also provided a definite small amount of mineral matter, which is found in the ash when the vegetable matter is burned.

The famous German chemist, Liebig, was a staunch supporter of de Saussure. Between them the "humus" theory was completely overthrown, and the foundations laid for the modern science of agricultural chemistry.

We now know that there are certain essential conditions and requirements necessary for successful plant growth. They may be summarised as follows:—

(1) A suitable medium for the mechanical support of the crop;
(2) Water;
(3) Heat;
(4) Light;
(5) Air, for oxygen supply;
(6) Nutrients.

Heat, light, and oxygen supply are factors essentially beyond our control, and, except under irrigated conditions, the crop is dependent on natural rainfall for its moisture. The provision of a suitable medium for the support of the crop and for the development of its root system comes under the heading of soil tillage and cultivation. The nutrients are the raw materials from which the plant manufactures its tissues, and we must study them in detail to acquire a clear understanding of plant nutrition.

If we should select a stick of cane and determine its composition, we would find first of all that it contained about 70 per cent. of water. The dry matter is largely composed of fibre, sugars, and proteins. If we should burn away all of the vegetable substance, we would find a residue of mineral matter, to the extent of about ¾ lb. from 100 lb. cane. Let us further examine these constituent parts of the cane, and determine the simplest units or *elements* from which they in turn are built up. Sugars and fibre contain only carbon, hydrogen, and oxygen; proteins contain, in addition, nitrogen, phosphorus, and sulphur; the ash is composed of silica, lime, magnesia, potash, soda, iron, and small amounts of other elements. It has been shown that there are ten elements essential to crop growth. These are carbon, hydrogen, oxygen, phosphorus, potassium, nitrogen, sulphur, calcium, iron, and magnesium. If one of these is withheld, crop growth is not possible. The plant usually contains other elements in small amounts, but these are incidental. Where, then, does the crop obtain its supply of essential nutrients, or plant-foods, as they are popularly known?

Water from the soil and carbon dioxide from the air supply all the carbon, hydrogen, and oxygen required; and indeed these elements constitute over 99 per cent. of the cane crop. The remaining seven elements make up between them less than 1 per cent. of the weight of the plant. They are supplied to the crop by the soil, being absorbed through the roots in solution with the soil moisture.

Most agricultural lands are able to supply all the sulphur, magnesium, iron, and lime which a cane crop requires; but it frequently happens that there is a marked deficiency in one or more of the remaining three plant-foods—nitrogen, phosphorus, and potassium. In order then to maintain the highest possible crop yields, it is necessary to supply any deficiency by the application to the soil of materials containing the required nutrients. These concentrated forms of plant-food materials applied in this way are known as *manures* or *fertilizers*. Such a fertilizer may consist of a substance which supplies only one of these three plant-foods; others contain a mixture of two; while those spoken of as *complete* fertilizers consist of a mixture of all three elements in various proportions.

The following list shows the composition of the chief ingredients employed in the preparation of these mixtures:—

(1) Sources of Nitrogen.

Sulphate of ammonia, containing 20 per cent. nitrogen in the water-soluble condition, as ammonia.

Nitrate of soda, supplying 16 per cent. of nitrogen as nitrates.

Blood, bone, and offal, containing from 3-14 per cent. of nitrogen in the organic form.

(2) Sources of Phosphorus.

Superphosphate, with 22 per cent. of water-soluble phosphoric acid.

Basic superphosphate, yielding 18 per cent. of phosphoric acid, not water-soluble, but readily available to the plant.

Rock phosphate, the naturally occurring material from which the commercial phosphates are manufactured. It contains up to 38 per cent. of phosphoric acid in a slowly soluble condition.

Bone, containing about 22 per cent. of phosphoric acid, in addition to a small amount of nitrogen.

(3) Sources of Potassium.

Muriate of potash, yielding 50 per cent. of water-soluble potash.

Sulphate of potash, with 48 per cent. of water-soluble potash.

Of the nutrients which are taken up in solution by the roots, all except nitrogen are ultimately derived from the rock minerals found in the soil. Under the action of the destructive forces of nature, these minerals are undergoing a continuous process of breaking up and decay, and the resulting decomposition products are thus made available for crop nutrition. Obviously, the nature of the products of decay will be governed by the composition of the minerals from which they are derived. Therefore soils formed from rocks of different composition will vary widely in the relative amounts of the different plant foods found in the soil solution. One soil may be able to supply an abundance of available potash, while the phosphorus supply is decidedly deficient.

Such is the case with many of our alluvial soils of the North derived from granite. The Woongarra red volcanic loam, on the other hand, is notably deficient in the amount of available potash which it is able to provide for crop needs.

At first sight it would appear to be a simple matter to determine what a soil lacks, in order to provide for any plant-food deficiency. Chemical analysis of the soil would show the percentage of the various nutrients present, and the earlier soil chemists eagerly seized on this method of investigation. But it was soon found that the method was often misleading. A soil may often contain 10,000 lb. of potash per acre, yet it is incapable of supplying the modest requirements of a 20-ton crop of cane—which is only about 80 lb. of potash. The fact is that the crop can use the potash only when it is in the so-called available condition; and the amount of potash made available to the crop during its growth period will depend on the rate at which the potash-bearing minerals decay under the natural soil conditions.

The average of a large number of analyses of Queensland cane crops shows that 1 ton of cane (including tops and trash) absorbs from the soil—

2 lb. nitrogen.
1 lb. phosphoric acid.
4 lb. potash.

A 30-ton crop will then require—

60 lb. nitrogen.
30 lb. phosphoric acid.
120 lb. potash.

Or, expressed in terms of common fertilizer constituents—

300 lb. sulphate of ammonia.
135 lb. superphosphate.
250 lb. sulphate of potash.

Total 685 lb. of the mixed fertilizer.

In addition, excessive rains during the wet season result in the leaching away of a further amount of the available plant-food before the crop roots are able to absorb it. Hence we can reckon that for our 30-ton crop the soil must be able to make available plant-foods considerably in excess of the amount contained in the 685 lb. of mixed fertilizer as calculated. In its virgin state, the soil might readily provide in a year all of the plant-food required by even a 60-ton crop. Under scrub vegetation, for instance, there is a considerable supply of available plant-food continually passing through the cycle—(*a*) absorption by tree roots; (*b*) passing into the leaves; (*c*) returning to the soil when the leaves die and fall; (*d*) decomposition of the vegetable matter in the soil to return the plant-food to the soil solution for reabsorption by the plant roots. When the natural vegetation is cut down and burned, this cycle is interrupted, and the available plant-food is diverted for use by the cane crop. Now, unlike the natural scrub growth, where all crop residues are returned to the soil, the cane, with all its plant-food, is removed from the land. Further, intensive cultivation of the soil stimulates the decomposition of humus and mineral matter; and some of the plant-food supply thus made available will be leached from the

soil before the crop roots are sufficiently extensively developed to absorb it. Unless some attempt is made to compensate for this rapid removal of plant-food, the soil supply must become seriously depleted, with a consequent falling-off in crop yield.

This has been the story throughout the Queensland cane areas. Certain soils have been able to maintain a supply of nutrients for a longer period than others, but even the most fertile lands will require, sooner or later, substantial additions of fertilizer if their fertility is to be maintained.

It has been stated that chemical analyses do not tell us absolutely what particular nutrient or nutrients are lacking in a soil. Certain soil tests do, however, provide us with a very useful guide in this respect, but the most reliable method of determining any deficiency is by means of direct field experimentation. Our problem is essentially this: Under the existing conditions of temperature, moisture supply, cultivation methods, &c., what crop might normally be expected? Provided other conditions are favourable, if our unfertilized crop falls below this value we might reasonably suspect that there exists a plant-food deficiency. We have already seen what a ton of cane requires in this respect; and we must therefore add to the soil at least the deficit between what the soil can normally supply and the total plant-food requirement of our crop.

This is stating the problem in its simplest terms, but actually the question is much more complex. However, the illustration should make it clear that the *kind* and *amount* of plant-food necessary to restore the balance of crop nutrients demanded by the increased crop might differ markedly from soil to soil. Unfortunately we have no method of determining the amounts of each plant-food which the soil can supply, and therefore must ask the soil the question by means of plot experimentation. If our experiment is well planned and carefully carried through, we will receive our answer in simple terms. As climatic and other environmental factors are by no means constant from year to year, our crop response to the same treatment will vary accordingly. By continuing our experiments over a period of years, it becomes possible for us to arrive at an accurate approximation of the kind and amount of fertilizer which will give, on the average, the most profitable return from fertilizing. The problem naturally becomes complicated by economic considerations, such as the fluctuating value of the crop, the purchase price of fertilizer constituents, &c. But our experiments have shown that under the present conditions it is possible to derive highly profitable returns from added fertilizer, provided that it contains the correct ingredients applied in the correct proportions.

We are now in a position to understand why the sulphate of ammonia alone gave splendid returns for a time, but later it ceased to increase the crop yield. The entire reserve of nitrogen in the soil is bound up in the soil organic matter or *humus*. This portion of the soil is the natural food of the numerous micro-organisms which live in the soil, and in the course of decomposition of this substance the nitrogen ultimately becomes available to our crop in the form of nitrate. If no attempt be made to restore the nitrogen supply by the ploughing under of leguminous crops, or the addition of fertilizers, the reduced supply of available nitrogen under our Queensland conditions rapidly becomes a limiting factor in crop growth. The sulphate of ammonia discussed above furnished a supply of nitrogen which, in becoming

rapidly nitrified and made available for crop growth, produced its visible effects very readily.

So long as the nitrogen supply was the only factor limiting crop production the addition of sulphate of ammonia alone was all that was necessary. Conditions similar to these actually exist on many of the rich Javan cane lands, and for many years the application of nitrogenous fertilizers alone has maintained their characteristically high degrees of productivity.

If, however, the phosphate or potash supply begins to enter as a limiting factor, the efficacy of the nitrogenous fertilizer alone will be seriously impaired; and if the situation becomes particularly acute, the response to nitrogen may be completely annulled. Hence, it is not a question of the failure of our "stimulant," but rather the entrance of new deficiencies for which no provision is being made. What we are actually adding in fertilizing is a concentrated form of plant-food, and the intelligent use of these materials is the true solution of the permanent productivity of our soils.

THE CONTROL OF THE BRONZE ORANGE BUG.

By W. A. T. SUMMERVILLE, B.Sc., Assistant Entomologist.

FOR some time past experiments have been in progress in an endeavour to find some more efficient method of combating the Bronze Orange Bug (*Rhœcocoris sulciventris* Stal.) than those which had previously been devised.

These efforts have now met with success. A series of tests have been conducted which show conclusively that a spray made up and applied as described below can be confidently recommended for use against this pest.

The tests have been made at each season of the year, and it was found that the spray, though somewhat effective against all immature stages of the insect, gave by far the best results against the second or over-wintering stage.

This is very fortunate for until the third instar is reached the insect does very little damage to the trees.

As regards the efficacy of the spray against the older-stage bugs the kills obtained in the experiments varied from 60 per cent. to 80 per cent. according to the stage in which the pest was sprayed.

Results with Second Stage Bugs.

The final test was made on the 21st May, 1931. On that day eighteen trees heavily infested with second-stage bugs were sprayed. The varieties used were Fewtrell early mandarins and Late Valencia oranges. The former trees were very thickly foliaged and were not less than 12 feet in height. These trees then gave as difficult conditions for spraying as would ordinarily be met with in this State.

Rain commenced to fall shortly after midnight on the 21st, and thus some of the dead bugs were undoubtedly lost. The trees were examined

on the 26th May, and large numbers of dead bugs were seen on the leaves and under the trees. As tapping would have resulted in knocking off too much fruit, only two trees were so treated. The following are the particulars obtained from these tapped trees:—

Tree Number 1.—Total number of bugs found, 792; number of these alive, 49. Apparent kill, 93·82 per cent.

Tree Number 2.—Total number of bugs found, 458; number of these alive, 18. Apparent kill, 96·1 per cent.

Grand total from two trees, 1,250; number alive on two trees, 67; number dead on two trees, 1,183. Apparent kill, 94.64 per cent.

The kill is stated as apparent as it is not possible to state that every bug was collected. However, the factors operating against the finding of the living bugs, it is considered, are not so numerous as those which tend to prevent the finding of the dead ones. This is borne out by the fact that an examination was made of the ground one week after the test was completed, and 102 more dead bugs were found. A light tapping brought down only one more live bug. These 103 insects are not included in the figures given above. They apply to Number 1 tree.

In regard to the other sixteen trees sprayed in this experiment, thorough examinations have been made, and it appears that an equally good result has been obtained on every one of them.

The previous tests against this stage of the bug gave similar figures.

Effect of Spray on Trees.

The effect of the spray on the trees has been given due consideration, and from all the experiments it is known that except in the very hot weather the trees suffered no ill effects whatsoever. Indeed, there is evidence that apart from its action on the Bronze Orange Bug the spray has other insecticidal value and possibly has some fungicidal properties also.

Thorough Application Necessary.

The spray is purely a contact one, and it cannot be too strongly emphasised that the results obtained by its use will depend absolutely on the thoroughness of the application. It is therefore recommended that if at all possible a power pump be used and the pressure kept as high as practicable.

Time of Application.

As regards time of application it will be found that the best results will be obtained by spraying as soon as possible after the insect reaches the second stage. In normal years this will be towards the end of March or early in April.

Unfortunately, it has not been possible to finalise the tests in time for the spray to be used generally at the best time this year, but growers will gain considerable benefit by spraying any time before the bugs moult into the third stage.

Under normal circumstances it is advisable to wait only until no more eggs are being deposited by the adults.

On account of an oil being one of the ingredients the spray must not be used in the very hot weather.

Preparation of Spray.

The formula of the spray is as follows:—10 lb. resin, 3 lb. caustic soda (good commercial quality), 1½ lb. fish oil, 40 gallons water.

The spray is prepared in the following manner:—Grind up the resin as finely as practicable. Mix the resin and caustic soda while dry. Put one-twentieth of the total volume of water into a container in which it can be boiled. It must be remembered that there will be considerable expansion when the solution boils, and the container should therefore be large enough to allow for this and thus eliminate the possibility of boiling over taking place. In small lots it was found that not more than 2 gallons of water should be put in a 4-gallon container. The addition of the solids, of course, increases the total volume.

Add the mixture of the resin and soda to the water and boil until a clear, dark solution is obtained, stirring occasionally to prevent sticking to the bottom. This boiling will take somewhere about two hours.

When the clear solution is obtained, add the fish oil and allow to boil for a few minutes to ensure emulsification of the oil. This stock solution is then ready for dilution—one part of stock solution to nineteen of cold water.

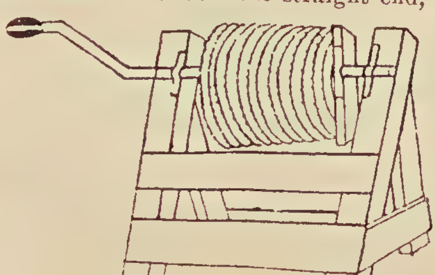
It will be found that, on cooling, the above stock solution deposits a good deal of solid. It is therefore advisable to draw on the stock only while it is hot. Most barrels hold either 40 or 75 gallons. It is then a good plan to divide the stock up into lots of 2 or 3¾ gallons as soon as it is prepared.

Before commencing to spray allow the agitator to work for a few minutes so as to make sure that an even solution is obtained.

The cost of the spray is about 2d. per gallon in small lots. It is an excellent spreader.

BARBED-WIRE WINDER.

The barbed-wire winder shown in the illustration can readily be made from material found on every farm, and it winds the wire on a spool just as neatly as is done in the factory. Two V-shaped end supports, 36 in. long, are made of 4 in. by 2 in. timber, the ends being spiked and bolted together. The supports are inverted, and cross-pieces are nailed on, the cross-pieces being about 30 in. long. A strap-iron bearing is screwed on each support near the top, or, if preferred, a ¾-in. hole can be drilled through the ends of the V supports to serve as bearings instead of the strap-iron pieces. A ¾-in. pipe or rod is bent to the shape of a crank, and a ¾-in. hole is drilled through the crank about 6 in. from the straight end, so that the spool can be



securely attached. The spool consists of two pieces of 5 in. by 1 in. by 16 in. wood, with a ¾-in. hole drilled through the centre, and two pieces of 5 in. by 1 in. by 20 in. wood nailed across the first. The winding crank is pushed through the bearings of the frame and holes in the spool, and a 6-in. spike or round piece of iron held by ordinary fence staples driven through one board of the spool keeps the spool securely on the crank.—"Farmers' Advocate" (South Africa).

EXPERIMENTS WITH THE HEAT TREATMENT OF FLY-INFESTED FRUIT.

By J. A. WEDDELL, Assistant Entomologist.

FOLLOWING on correspondence with the Committee of Direction of Fruit Marketing this Department decided to investigate the recently-evolved American heat-treatment method of handling fruit-fly-infested fruit. During last summer experiments were accordingly carried out to determine whether it would be at all applicable to Queensland conditions and to fruits other than citrus.

American Method.

The treatment of the citrus fruit as carried out in North America consisted of heating the fruit to a temperature between 110 deg. Fahr. and 112 deg. Fahr. (not to go above 115 deg. Fahr.) at the centre of the fruit and holding it at that temperature for a period of eight hours in an atmosphere saturated with water vapour. It had been found that this temperature was effective against the insect concerned (the Mediterranean fruit fly) without either being harmful to the fruit, affecting the flavour and eating qualities, or inducing the growth of rots. The saturated atmosphere ensured that drying and withering of the fruit did not take place. While details of the apparatus used in America were not given, it was indicated that the cases of fruit were stacked in insulated rooms and "conditioned air"—that is, air at the right temperature and humidity was pumped at low pressure through ducts in the floor of the chamber at the rate of five to six thousand cubic feet of air per minute for a chamber holding a carload of fruit, approximately 500 cases. Specifications of the apparatus have been asked for, and until these come to hand a definite idea of costs cannot be obtained. It has, however, been ascertained that a standard air-conditioning plant to handle that volume of air would cost approximately £350 fitted up in Brisbane. Allowing another £250 to £350 for a small building containing a chamber to treat 500 cases, housing for the plant and a small reception area, which appears to be quite a conservative estimate, it is then seen that an outfit would cost £600 to £700. This brief approximation is presented so that some consideration may be given to the financial aspect of the method.

Apparatus used in Brisbane.

Apparatus giving the required conditions in the manner described was, of course, not available for the Brisbane experiments, but through the courtesy of Dr. L. S. Bagster, of the University of Queensland, the use of a small experimental banana-ripening chamber was obtained, and this, with slight adjustments, gave the required conditions of temperature and saturated atmosphere. The apparatus consisted of an insulated chamber heated by means of carbon filament lamps, the number and candle power of which were adjusted so that a temperature somewhat in excess of the one required was obtainable. Exact control was then given by means of a relay circuit operated by contacts fitted in a bulb of toluene. The heated air was circulated by means of a fan, first through

a baffle of wetted cloths dipping in water, and then throughout the chamber. The essential point to be noted is that in the experiment the same enclosed air was continuously circulated, whereas in the larger apparatus as used in America fresh-conditioned air would be continuously supplied. Owing, however, to the small volume of the chamber and to the relatively small quantity of fruit placed therein at each treatment it was not considered that the difference of method would be material. Furthermore, an examination of the air after one of the treatments showed only 0·6 per cent. CO_2 to be present.

The chamber was fitted with wet and dry bulb thermometers, and a long-stemmed thermometer was available for recording the temperature at the centre of the fruit.

Preliminary Trial.

On 24th February, after the apparatus had been adjusted to the required conditions, a preliminary trial was given for the purpose of observing the time required for the heat to penetrate to the centre of one fruit. For this purpose the long-stemmed thermometer was inserted into an apple which was packed into a case, and it was so arranged that the scale of the thermometer protruded to the exterior of the chamber.

Table I. shows the results from this trial. It will be seen that while the chamber had arrived at the required temperature in one hour, a total of four hours was necessary before the centre of the fruit became suitably heated.

TABLE I.

TEMPERATURES TAKEN AT HALF-HOURLY INTERVALS SHOWING PENETRATION OF HEAT TO CENTRE OF FRUIT.

Time of Reading.	Temperature—Deg. Fahr. Dry Bulb.	Temperature—Deg. Fahr. Wet Bulb.	Relative Humidity.	Temperature at Centre of Apple—Deg. Fahr.
			Per cent.	
24th February, 1931—				
2.40 p.m.	77	70·7	72	78·3
3.10 p.m.	99·5	98·6	96	79·2
3.40 p.m.	111·2	109·8	95	83·1
4.10 p.m.	112·1	111·2	96	90·5
4.40 p.m.	115·7	114·5	97	97·7
5.10 p.m.	110·2	110·2	100	103·1
5.40 p.m.	110·3	110·3	100	106·5
6.10 p.m.	113·4	113	98	109·1
6.40 p.m.	111·2	111·2	100	110·5

Experiment I.

At 8.30 p.m., 25th February, the following fruit was placed in the chamber:—Two oranges (normal), two oranges (fruit fly infested), three peaches (fruit fly infested), three persimmons (fruit fly infested), a half a bushel of apples (mostly infested with codling moth). It is necessary to state that a certain difficulty was experienced in obtaining a sufficiency of suitably stung fruit for the purposes of the experiments. Throughout the experiments the fly concerned was the Queensland fruit fly (*Chætodacus tryoni* Frogg.).

The chamber was opened at 8.30 p.m., 26th February, thus allowing the four hours which had been proved necessary to heat up the fruit together with the eight hours' treatment. Sample temperatures taken during the treatment were as follows:—

TABLE II.

Time of Reading.	Temperature—Deg. Fahr.		Relative Humidity.
	Dry Bulb.	Wet Bulb.	
25th February, 1931—			Per cent.
8.30 p.m.	86	84·2	92
9.50 p.m.	114	113	97
10 p.m.	110·3	110·3	100
10.10 p.m.	112·7	112·5	99
10.20 p.m.	110·3	110·3	100
10.30 p.m.	112·5	112·5	100
10.40 p.m.	110	109·8	99
26th February, 1931—			
8.35 a.m.	111·6	111·2	98

A quarter bushel of apples and samples of the other fruits were held as controls.

Portion of the treated fruit was opened immediately after treatment, when it was found that the fruit fly maggotts were motionless. They were later proved to be dead; no living maggotts or codling moth larvæ were seen in any of the treated fruits subsequently. Apples were tasted at intervals and were found to be unaffected in flavour by the treatment. Five days after the treatment some apples were noticed with a "cooked" appearance. The tissue while still remaining white was soft and watery, the skin was loose, broken, and wrinkled, and the normal reddish colour of the skin was bleached to a dirty cream. A brown heart often accompanied the softening of the fruit. Others of the apples became affected also with normal brown rotting and bruising. By 9th March, eleven days after treatment, only one apple remained unaffected from one rot or the other. One orange kept until then was of good flavour.

The larvæ in the untreated fruit were still alive at the end of eighteen days. Although rotting did take place in the untreated fruit, in no instance was it of the same nature as the "cooked" symptom of the treated.

Experiment II.

Half a bushel of apples (codling moth and slight fruit fly infestation), a quarter bushel of pears (fruit fly infested), and three peaches (fruit fly infested) were treated from 10.45 a.m. to 10.30 p.m., 27th February. One third of the quantity of apples was retained untreated for comparison.

Temperatures taken during this run were as shown in Table III. It will be noticed that the relative humidity was somewhat variable in this instance.

TABLE III.

Time of Reading.	Temperature—Deg. Fahr. Dry Bulb.	Temperature—Deg. Fahr. Wet Bulb.	Relative Humidity.
27th February, 1931—			Per cent.
10.45 a.m.	77	71·6	79
12 noon	114	110·9	88
12.30 p.m.	110·9	108·5	92
4.30 p.m.	110·9	110·9	100
10.30 p.m.	109·4	107·7	94

No living insects were seen in any of the treated fruits after removal from the chamber. A total of ten apples became affected with the "cooked" symptom, the first two showing up on 4th March (five days). All of the apples except five developed soft areas or rots by 19th March (twenty days after treatment). Five apples were apparently unaffected by the treatment. The pears were unfit for food because of fly infestation prior to the treatment and so could not be sampled later.

The control fruit was examined at intervals, but none were seen exhibiting the "cooked" appearance, although rots of various kinds showed up in a number of them.

Experiment III.

Eight grape fruit showing fruit fly stings were treated from 10.50 p.m., 27th February, to 11.5 a.m., 28th February. Six grape fruit were held as controls. The fruit was matured but unripe. Temperatures taken during the treatment were as shown in Table IV.

TABLE IV.

Time of Reading.	Temperature—Deg. Fahr. Dry Bulb.	Temperature—Deg. Fahr. Wet Bulb.	Relative Humidity.
27th February, 1931—			Per cent.
10.50 p.m.	85·1	83·3	91
11.20 p.m.	115·2	114·9	99
11.30 p.m.	110·9	110·5	98
28th February, 1931—			
9 a.m.	112·7	112·7	100
11.5 a.m.	111·2	111·2	100

The fruit of both the treated batch and the control was examined at intervals. Although batches of eggs were dissected from both lots, at no time was it possible to find any hatched larvæ. Whereas, however, by 16th March (sixteen days after treatment) the eggs in the treated batch had become brownish, some of those that remained in the control were still healthy in appearance. This record of the non-development of the larvæ in green citrus is corroborative of field observations made by Mr. W. A. T. Summerville, Assistant Entomologist, Nambour.

The texture of the fruit remained unaffected by the treatment.

Experiment IV.

A small case of fruit-fly-infested oranges was treated from 9 p.m. 4th March to 9.20 a.m. 5th March. The fruit was variously affected, recent stings to mature larvæ being represented. Similar fruit was held as a control. The following temperatures in Table V. were taken:—

TABLE V.

Time of Reading.	Temperature—Deg. Fahr.		Relative Humidity.
	Dry Bulb.	Wet Bulb.	
4th March, 1931—			Per Cent.
9 p.m.	82·4	78·8	84
9.30 p.m.	96·8	95·2	94
9.45 p.m.	106·7	105·8	97
10 p.m.	113	111·2	94
10.10 p.m.	110·9	110·2	97
10.20 p.m.	111·2	111·2	100
5th March, 1931—			
9.20 a.m.	110·8	110·8	100

No living maggotts were seen in the treated fruit. Unhatched eggs were still present in stings that were examined up to 20th March (fifteen days after treatment). Unfortunately, however, unhatched eggs were similarly found in stings in the control fruit on that date. Maggotts, however, remained alive in the control fruit. No difference in flavour could be detected between the treated fruit and the control.

Experiment V.

A small case of quinces infested by fruit fly was treated from 10 a.m. to 10 p.m. 6th March, some of the fruit being held as a control. The temperatures given in Table VI. were recorded.

TABLE VI.

Time of Reading.	Temperature—Deg. Fahr.		Relative Humidity.
	Dry Bulb.	Wet Bulb.	
6th March, 1931—			Per cent.
10 a.m.	76·2	75	94
10.15 a.m.	95·7	91·4	84
10.30 a.m.	106·3	102·4	84
10.45 a.m.	114	108·2	81
11.30 a.m.	111·2	111·2	100
11.45 a.m.	110·5	110·5	100
2.30 p.m.	110·9	110·9	100
4 p.m.	110·3	110·3	100
5 p.m.	111·1	111·1	100
9.15 p.m.	110·7	110·7	100
10 p.m.	110·3	109·4	97

The infesting larvæ were killed in the treated fruit. A comparison of flavour was not possible owing to the inedibility of the fruit, but there was no obvious difference in the appearances of the two batches.

Summary of the Experimental Results.

1. It was found possible to approximate fairly closely to the requirements of temperature and relative humidity as laid down for citrus fruit treatment in Florida.

2. It was proved that exposure to temperatures between 110 deg. Fahr. and 115 deg. Fahr. at approximately 100 per cent. relative humidity for eight hours would kill the larvæ of the Queensland fruit fly (*Chætodacus tryoni* Frogg.) infesting apples, oranges, peaches, pears, and persimmons. Incidentally it was also found that codling moth larvæ were killed by those conditions.

3. Ability to kill the eggs of the Queensland fruit fly in oranges and grape fruit was not proved owing to the failure of eggs laid in the control fruit to hatch. There is, however, no reason to doubt that the eggs would be killed.

4. A number of the apples became peculiarly soft, watery, and loose-skinned, presenting a "cooked" appearance some five days or more after treatment, and this symptom appeared distinct from various storage rots and bruises. Apparently these fruits were affected by the treatment.

5. Only fruit-fly-infested fruits of peach, pear, and persimmon were used, so the keeping qualities of treated fruits could not be ascertained. It is likely that such fruits would, however, be more adversely susceptible than apples to the treatment.

6. The flavour of the citrus fruit was unaffected.

Discussion.

It has often been stated in connection with the fruit fly problem that if there were available some method of killing any eggs or very young larvæ that were present in the fruit at the time of packing a saving of fruit and of otherwise wasted labour of handling and cost of freight would be effected. No matter how carefully the fruit is inspected when being packed a percentage, during a serious fruit fly season, contains unnoticed recent stings, and by the time this fruit has arrived at the market the work of the insects has become obvious, and the fruit is rejected. It has consequently been argued that any practical method of reducing these losses when they occur would be of value. Consideration must, however, be given to some general principles to see how far this contention is borne out.

An acceptable method would need to fulfil the following conditions:—

1. It must be effective in killing the insects within the fruit.

2. It must accomplish this without injury to the tissue of the fruit or to the eating qualities, either immediate or showing up at a later date in comparison with similar untreated fruit.

3. The treatment must occupy as short a time as possible so as to enable the marketing of the fruit without undue delay, and also to save as little duplication of apparatus as possible, duplication that would be necessary in order to handle the incoming fruit if the process were a long one.

4. The apparatus should not be of a very expensive type nor entail any considerable upkeep, as under Queensland conditions of relatively scattered fruitgrowing many sets of the apparatus would be needed in order to provide each centre with a suitable outfit.

As well as being able to fulfil these conditions it must also be definitely established that the fruit fly losses of the type mentioned (that is, recently stung fruit unobserved at the time of packing) are generally of a sufficient magnitude to warrant the expense entailed.

The heat method of treatment in relation to Queensland conditions can now be considered.

It must be recognised that the treatment was originally designed in North America as a quarantine measure and not merely to save the actually stung fruit. The Mediterranean fruit fly had been found in a very important citrus district which was also in relative proximity to the huge fruit industry of California and other States. As a portion of a heroic effort to prevent the spread of the fly and the consequent damage to the whole industry, all of the fruit from a large area surrounding the infestation was subjected to treatment before leaving the area either by the heat method as herein described or by cold storage at a temperature of 30-31 deg. Fahr. for a period of fifteen days. It was absolutely essential that not a single fruit containing living fruit fly in any stage should be exported from the infested district.

Here in Queensland the fruit fly is already present throughout the deciduous and citrus fruit districts, and no comparable saving to the industry as a whole could follow the treatment of the fruit. The incidence of fruit fly infestations would not be noticeably affected.

When packing fruit, all stung fruits that are seen are rejected, and no matter how satisfactory were the methods of treatment this practice obviously could not be varied. The only saving of marketable fruit that would be effected by the heat treatment would be the fruit which had been recently stung but which was overlooked when packing.

As the treatment would need to be applied as soon as possible after picking the fruit in order to prevent damage to the tissue by young larvæ, a treatment plant would be necessary at each railing centre at least, and a large capital expenditure would thus be involved. However, from the point of view of the possible establishment and extension of export trade, particularly in citrus fruit, wherein the fruit might require a guarantee of freedom from living fruit fly in any stage, this method of treatment may eventually prove worthy of consideration.

The method of treatment would need to be modified somewhat in order to be suitable for use in the deciduous fruit industry, owing to the indicated risk to the tissue of such fruits, and the modifications necessary could be determined only after considerable experimental work, even supposing such modifications to be possible.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

CLIMATOLOGICAL TABLE—JUNE, 1931.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	30·04	81	71	84	13,14,15	62	29	334	14
Herberton	..	71	56	75	16, 30	40	26	166	15
Rockhampton	30·16	77	58	85	12	45	17	37	11
Brisbane	30·21	71	54	79	12	46	16	57	10
Darling Downs.									
Dalby	30·22	69	46	78	11	34	27	133	3
Stanthorpe	..	61	40	72	11	26	14, 16	205	8
Toowoomba	..	63	45	72	8, 11	33	27	140	4
Mid-Interior.									
Georgetown	30·03	87	63	91	12	56	18, 30	0	..
Longreach	30·12	79	52	88	11, 18	40	26	25	1
Mitchell	30·20	68	45	82	11	33	27, 1	134	4
Western.									
Burketown	30·04	85	63	92	13	52	26, 27	0	..
Boulia	30·10	78	51	90	10	40	1	21	2
Thargomindah	30·17	64	47	82	10	40	1	195	4

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1931 AND 1930 FOR COMPARISON.

Divisions and Stations.	Average Rainfall. June.	No. of Years' Records.	Total Rainfall. June. 1931.	June. 1930.
North Coast. ..	In.		In.	In.
Atherton	1·60	30	2·05	1·14
Cairns	2·80	49	5·80	3·40
Cardwell	2·02	59	1·14	0·70
Cooktown	2·03	55	3·34	4·00
Herberton	1·03	44	1·66	0·57
Ingham	2·35	39	1·60	2·92
Innisfail	7·13	50	11·17	11·26
Mossman Mill ..	2·05	18	3·95	2·29
Townsville	1·32	60	0·10	1·37
Central Coast.				
Ayr	1·46	44	0	1·71
Bowen	1·64	60	0	3·28
Charters Towers ..	1·31	49	0·01	1·86
Mackay	2·68	60	0·48	3·07
Proserpine	3·49	28	0·79	6·57
St. Lawrence ..	2·58	60	0·31	7·77
South Coast.				
Biggenden	2·32	32	0·36	7·01
Bundaberg	2·96	48	1·17	8·76
Brisbane	2·82	80	0·57	7·58
Caboolture	2·88	44	1·14	12·37
Childers	2·65	36	0·50	8·70
Crohamhurst ..	4·88	38	1·09	21·36
Esk	2·40	44	0·38	9·95
Gayndah	1·89	60	0·37	4·04
Gympie	2·80	61	0·69	10·69
South Coast—continued:	In.		In.	In.
Kilkivan	2·21	52	0·44	5·63
Maryborough ..	3·14	59	1·63	11·37
Nambour	4·05	35	1·50	18·54
Nanango	2·12	49	0·43	5·07
Rockhampton ..	2·57	44	0·37	10·47
Woodford	3·14	44	0·82	14·56
Darling Downs.				
Dalby	1·71	61	1·33	2·36
Emu Vale	1·59	35	1·54	3·75
Jimbour	1·74	43	1·13	2·25
Miles	1·84	46	1·55	2·24
Stanthorpe ..	1·96	58	2·05	4·70
Toowoomba ..	2·52	59	1·40	8·31
Warwick	1·80	66	1·70	3·23
Maranoa.				
Roma	1·64	57	1·04	1·28
State Farms, &c.				
Bungeworgorai ..	1·47	17	0·87	1·34
Gatton College ..	1·74	36	0·47	5·93
Gindie	1·52	32	0	1·61
Hermitage	1·93	25	1·61	2·84
Kairi	1·43	17	..	0·86
Mackay Sugar Experiment Station	2·40	34	0·26	3·38

GEORGE G. BOND, Divisional Meteorologist.

BRIGHT TOBACCO.

By N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture, Department of Agriculture and Stock.

In this comprehensive article Mr. Pollock deals with the production of bright tobacco in North Queensland from all angles. He is one of the men of long vision who early realised the potentialities of the North as a producer of bright leaf of high commercial value, and his account of the development of the industry and cultural methods employed—the result of close study, experiment, and lengthy practical experience—will be welcomed by all interested in the present strong revival in the cultivation of tobacco, which has already proved to be a profitable crop on suitable Queensland soils.—Ed.

HISTORICAL SKETCH.

That the use of tobacco for smoking was known and practised by the indigenes of America long before the dawn of our civilisation has been proved by the researches of archæologists, who, amongst ancient ruins and in excavations of pre-historic mounds, in widely separated parts of both North and South America, brought to light many examples of pipes of varied and curious design which could only have been used for smoking tobacco.[1]

There is nothing to suggest that the tobacco plant, or its use, was known to the inhabitants of other parts of the world prior to the discovery of America by Columbus in 1492, since neither in history nor legend is mention made of it, nor are relics of ancient smokers' appliances found elsewhere than in America.

On his first voyage Columbus beheld the natives smoking tobacco, and in a subsequent voyage noted that they also chewed and snuffed it,[1] while the observations of subsequent explorers established the fact of its universal use.

It can readily be imagined that trials of what appeared to give so much satisfaction to the natives were soon made and the habit of smoking acquired by many of these early adventurers.

Though the first recorded instance of its importation into Europe was in 1558, when Francisco Fernandez returned from Mexico to Spain, and into England through the agency of Sir Walter Raleigh in 1586,[1] it is extremely probable that a knowledge of its use was carried by sailors and others many years before, not only to Europe but to Asia, as a record of its cultivation in Ceylon in 1610[2] suggests a much earlier acquaintance in India and China, where the Portuguese missionaries and traders had made much travel.

The fact that smoking became popular in England from 1586 suggests that the importation then and subsequently was in appreciable quantity, indicating that production on a commercial scale had already been entered upon. This would give credence to the contention that the Spaniards first commenced the culture of tobacco at the settlement in San Domingo in the year 1531.

The first recorded instance of tobacco production in a British possession was in 1612, when John Rolfe grew a crop in the then colony of Virginia for export to the mother country.[1] This proving successful, areas were placed under crop by other settlers, and production rapidly expanded until tobacco leaf became the chief article of export. Tobacco is now grown in every country where climatic conditions permit, and with an annual output, that has been estimated as probably in the vicinity of 4,000,000,000 lb. avoirdupois, forms one of the major agricultural products of the world.

In Australia, though the crop has been grown for upwards of sixty years, the quality of leaf has not found favour with consumers owing to defects in flavour and aroma, due, it has been suggested, to the crop being grown on unsuitable soil.

Recent developments, however, in Queensland, especially in the Northern division (detailed in the "Queensland Agricultural Journal" for October, 1930, and in the Departmental pamphlet, "Bright Tobacco in North Queensland"), where there are

[1] "Tobacco Leaf," Killebrew and Myrick.
[2] "The Commercial Products of India," Watt.

large areas of very suitable soil in a congenial climate, have demonstrated that bright tobacco leaf can be produced that will merit the approval of the Australian consuming public as well as that of connoisseurs, and eventually displace almost, if not wholly, that which is now imported from overseas.

It has been also affirmed by competent authorities that when Australia's consumption has been overtaken a profitable market awaits the best grades of North Queensland leaf in Great Britain.

STATISTICS OF TOBACCO.

The following figures, extracted from the latest Commonwealth Year Book available, indicate the amount of Australian-grown and imported leaf manufactured in each of the previous five years, the values of imported unmanufactured leaf, and those of imported tobaccos manufactured elsewhere:—

RESPECTIVE QUANTITIES OF AUSTRALIAN-GROWN AND IMPORTED TOBACCO LEAF MANUFACTURED IN AUSTRALIAN FACTORIES.

Year.	Australian Grown.	Imported.	Total.	Relative Australian.	Percentages Imported.
	Lb.	Lb.	Lb.	%	%
1924-25 ..	1,066,763	17,006,274	18,133,037	5·88	94·12
1925-26 ..	1,152,132	17,509,175	18,661,307	6·17	93·83
1926-27 ..	1,212,794	17,396,718	18,609,512	6·51	93·49
1927-28 ..	1,007,089	17,613,104	18,620,193	5·40	94·60
1928-29 ..	978,030	18,157,689	19,135,709	5·11	94·89

QUANTITIES AND VALUES OF IMPORTED TOBACCOS.

Year.	Manufactued.	Value.	Unmanufactured.	Value.
	Lb.	£	Lb.	£
1924-25	645,020	105,071	19,110,700	2,005,939
1925-26	619,503	97,648	22,040,123	2,250,305
1926-27	1,273,873	176,046	22,140,918	2,018,295
1927-28	1,187,202	171,800	23,682,640	2,168,402
1928-29	1,013,981	149,173	21,129,742	1,904,469

Year.	Cigars.	Value.	Cigarettes.	Value.	Snuff.	Value.
	Lb.	£	Lb.	£	Lb.	£
1924-25 ..	97,789	94,895	328,503	203,209	3,159	1,076
1925-26 ..	107,221	113,491	547,425	297,812	2,638	920
1926-27 ..	121,779	115,360	744,571	393,386	4,315	1,667
1927-28 ..	128,713	138,591	946,350	480,798	3,442	1,029
1928-29 ..	85,980	94,760	840,027	428,127	2,961	1,169

Year.	Total Lbs. of Tobacco Imported.	Total Value.
	Lb.	£
1924-25	20,185,171	2,410,190
1925-26	23,316,910	2,759,332
1926-27	24,285,456	2,704,754
1927-28	25,948,347	2,960,620
1928-29	23,072,691	2,577,698

It will be noted from these figures that, excluding cigar leaf, White Burley, or other leaf such as Turkish, Latakia, &c., which are cured by other processes and which, though considered possible of production in the Commonwealth, are not discussed herein, there is an existing market annually for at least 20,000,000 lb. of flue-cured tobacco.

While the average yield of bright tobacco in America, where the average grower has had years of experience, is in the vicinity of 600 lb. per acre, it is not to be expected that in Queensland, with so many growers entering on production with little if any previous experience, an average yield of more than 500 lb. per acre could be contemplated in Australian production for many years to come.

Allowing 500 lb. per acre as an average yield, upward of 40,000 acres will be required to meet Australia's present demand, which will probably be much increased before that acreage is placed under crop.

Duties and Excise.

During the year 1931 the import duties on tobaccos other than cigar leaf and manufactured cigars were substantially increased, all lines in addition being subjected to an additional primage duty of 4 per cent.

Excise duties were unaltered except on cigars, when a reduction of 2s. 5d. per lb. was made both in hand and machine made.

It is not considered likely that the Customs tariff now operating will suffer reduction for many years to come, if at all, as tobacco is regarded in most countries as a fruitful source of revenue. With these duties operating, the production of bright tobacco should offer a great attraction in those districts of the State that provide the requisite soil types and climatic conditions.

IMPORT AND EXCISE DUTIES ON TOBACCO.

IMPORT DUTIES.

Item.	Per lb. s.	d.
18. Tobacco, unmanufactured	8	6
19. Tobacco, unmanufactured, entered to be locally manufactured into tobacco or cigarettes, to be paid at the time of removal to the factory—		
(a) Unstemmed	5	2
(b) Stemmed, or partly stemmed, or in strips	5	8
20. Tobacco, cut, n.e.i.	9	3
21. Tobacco, manufactured, n.e.i., including the weight of tags, labels, and other attachments	9	0
22. Cigarettes, including weight of cards and mouth-pieces contained in inside packages; fine-cut tobacco, suitable for the manufacture of cigarettes	16	0
23. Tobacco, unmanufactured, entered to be locally manufactured into cigars, to be paid at the time of removal to the factory—		
(a) Unstemmed	2	6
(b) Stemmed, or partly stemmed, or in strips	3	0
24. Cigars, including the weight of bands and ribbons	20	0

In addition, all lines are subject to a primage duty of 4 per cent.

EXCISE DUTIES.

	Per lb. s.	d.
Item 6. Tobacco—		
(a) Tobacco, hand-made strand	2	1
Hand-made Tobacco.—"Hand-made tobacco" shall mean tobacco in the manufacture of which all operations are entirely carried on by hand without the aid of machine tools or machinery other than that used in the pressing of the tobacco.		
(b) Tobacco, manufactured, n.e.i., made in Australia both from imported and locally grown leaf	2	4
(c) Tobacco, fine cut, suitable for the manufacture of cigarettes	7	3
Item 7. Cigars—		
(a) Hand-made	0	3
Hand-made Cigars.—"Hand-made cigars" shall mean cigars in the manufacture of which every operation is performed by hand, provided that moulds may be used.		
(b) Machine-made	1	3

Item 8. Cigarettes (including the weight of the outer portion of each cigarette)—

(*a*) Hand-made	7	3
Hand-made Cigarettes.—"Hand-made" shall mean that the whole of the operations connected with the filling and completion of cigarettes shall be performed exclusively by hand.		
(*b*) N.e.i.	7	6

THE TOBACCO PLANT.

Tobacco is botanically classified as the genus *Nicotiana* under the natural order Solanaceæ, which embraces many other genera, of which the potato, tomato, egg plant, capsicum, &c., afford well-known examples.

The so-called wild tobacco, a species of the genus *Solanum*, which grows so freely on newly-cleared scrub lands, and the tree *Duboisia Hopwoodii*, the leaves of which, containing an alkaloid analogous to nicotine, form the Pituri of the Australian aborigine, are also members of this natural order.

Systematic botanists have described and classified over thirty-five distinct species of *Nicotiana* which, excepting a very few found in Australia and some of the Pacific Islands, are indigenous to America.

Only a small number of the species of *Nicotiana*, each of American origin, have been found to yield tobacco, and of these but three are noted as being cultivated to-day:—

Nicotiana persica, cultivated in Persia, from which the Shiraz tobacco is obtained.

Nicotiana rustica, which is cultivated to an extent in India and also in Western Europe, and is suggested by Killebrew and Myrick ("Tobacco Leaf," Orange Judd Company, New York) to yield the tobaccos known as Turkish, Hungarian, and Latakia.

Nicotiana Tabacum, from the varieties of which by far the greatest part of the world's supply of cigar, cigarette, and pipe tobacco is obtained.

The tobacco plant has been aptly termed a weed, since it will grow on almost any soil that is sufficiently warm and well drained, and under very diverse climatic conditions when enough moisture is provided and frost is not experienced in the growing season.

There is, however, a pronounced difference in the quality of leaf produced on different soils, and also on similar soils in different climates.

Probably no plant is more influenced by environment than tobacco—changes in that direction leading to mutations and variations not only in plant characteristics but in essential leaf quality.

Climatic conditions in the production of leaf grown on different classes of soil are held to exert an influence on texture and colour, while the original growths from which the humus in the soil was derived are suggested to have an influence on the aroma and flavour of the cured product.

As a result different types of the plant have been developed which will yield under certain conditions of soil and climate, together with a particular method of treatment, a class of tobacco peculiar to each.

These types have again been divided into varieties and strains of such varieties by selection and hybridisation to allow of one or more, while conforming to type, suiting particular areas or localities.

In the early years of production by the Virginian colonists attention was given to the most fertile soils, which yielded generally a leaf of more or less heavy texture, but as settlement proceeded others of varying texture and fertility came into use. The result was to produce tobacco leaf differing in degrees of essential quality, which allowed a discrimination by the consumer.

Early Curing Methods.

The first system of curing consisted in a simple drying of the leaf under natural atmospheric conditions, which were later regulated to a considerable extent by the use of buildings in which control of ventilation played an important part.

Subsequently the curing process in these buildings was assisted and accelerated by the use of heat from the burning of wood in open fires, to be later improved by the use of charcoal through which the creosotic odour and flavour imparted to the leaf by the smoke from the burning wood was avoided.

The heat of the burning charcoal, without any attendant smoke, being found to allow the attainment of a brighter colour in the cured leaf, especially in that grown on light-textured soils, invited the application of heat radiated from pipes or flues arranged close to the floor of the buildings, through which the heated gases and smoke from a fire would pass without coming into contact with the leaf.

The substitution of heating flues for charcoal fires not only eliminated the possibility of any smoky flavour or odour being transmitted to the leaf under cure, but allowed the definite regulation of heat and humidity in the curing structure. By this means it was found the percentage of bright-coloured leaf could be much increased and the quality of the cured article greatly improved.

Thus the variation in leaf quality through growth on dissimilar soils, as well as under different climatic conditions, was further amplified by the methods of curing.

Properties of the Plant.

The chief attraction in the use of tobacco, whether for smoking, chewing, or snuffing, is due to the generally pleasurable and soothing effect on the nerves from the action of the narcotic alkaloid nicotine which it contains in varying proportion according to the character of the leaf. The heavier and stronger the leaf the larger, as a rule, is the proportion of nicotine.

Other properties contained in the leaf combine to produce a flavour and aroma which, by adding to or detracting from the satisfaction engendered, influence the demand for leaf produced on different soils and also in different districts, as well as in different countries, according to the manner in which it is cured.

Hence the mildness, pleasing flavour, and aroma of flue-cured leaf to the degree of which its beautiful colour is regarded an index has found such flavour as to be now in almost universal demand in Australia.

PRODUCTION OF BRIGHT TOBACCO.

Climate.

In the production of bright tobacco climatic conditions will throughout growth, and especially during the ripening and harvesting period, exercise considerable influence on leaf quality as well as yield.

Extremely humid conditions, particularly under high temperatures, tend towards the production of extra large thin leaves which are deficient in gum, and, though occasionally curing a bright colour, generally are lacking in lustre and do not weigh well.

On the other hand, with little rainfall and hot, bright days, with little atmospheric humidity, the leaf will be small in size, thick and firm, with an abundance of gum which interferes with its burning quality.

The best quality leaf is yielded by plants in which the growth has been regularly maintained from the time of setting out in the field to the ripening of the leaf. Warmth and a sufficiency of moisture in the soil without extremes of atmospheric temperature and plenty of sunshine, especially during the ripening period, are conducive to the best results. Cold nights, during which the growth is not maintained, or very hot, dry days, when the plants droop, cause a check in development that is more or less prejudicial to quality.

An ideal climate is one in which the daily average temperatures are high without extremes, and accompanied by an appreciable atmospheric humidity.

In the State of Queensland suitable climatic conditions will be found practically in all its degrees of latitude where the rainfall averages between 25 and 45 in. per annum.

Rainfall.

The rainfall should be moderate rather than heavy, and well distributed during the growing season, being limited to light showers when the leaf is approaching ripeness, with fine weather at harvest.

About 20 in. during the growing period is regarded as very satisfactory, but on well-drained soils a heavier precipitation is not detrimental, while excellent crops can also be secured with a lighter fall when soil conditions are suitable.

Dull cloudy days with frequent light showers are most effective in promoting establishment and early growth when the young plants are set out in the field. Occasional falls thereafter with days of bright sunshine broken by passing clouds through which excessive evaporation is hindered and a more even temperature sustained, combine, when growth is made on suitable soil, to produce leaf of the highest quality and brightest colour.

Season.

In a suitable season with proper cultivation the period covered from the sowing of the seed in the seed-bed to the harvest of the leaf should not exceed 160 days, or 120 days after the plants were set out in the field.

The growing season after transplanting can thus be calculated as four months, during the first two of which the rainfall should be ample to promote growth, with lessening falls in the third month and practically fine weather in the fourth.

In most parts of the State average seasonal conditions would suggest the setting-out of the plants in late December or early January, or at the commencement of the wet season, so that the best rainfall would be experienced from then on to mid-March, when precipitations as a rule rapidly decline, with only occasional light falls in April and May, when the harvest would be completed.

In the cooler parts, however, an earlier transplanting is indicated, so that the leaf will ripen before the nights become cold, and be all cured before frost is likely to occur.

Irrigation.

Irrigation will be of value in seasons when the rainfall is deficient, but leaf grown wholly by that means cannot be expected to yield a quality comparable with that produced under natural conditions.

When irrigating, light applications in furrows between odd and evenly numbered rows alterately are suggested at short intervals rather than otherwise. A heavy saturation of the soil should be avoided, as excessive moisture induces a coarse-textured leaf that is difficult to cure a bright colour.

Cultivation should closely follow irrigation to keep the soil aerated and to lessen evaporation.

Shelter.

When clearing land for tobacco it is advisable to leave belts of trees standing on the windward side as a protection against the effects of a strong breeze, which is apt to cause damage to the leaf, especially towards and at maturity, when it is brittle and easily broken. Where the stand of timber is somewhat thin the planting of others of quick growth is suggested. In addition to acting as a wind-break the shelter belt will afford harbourage for many of the birds that are of material assistance in the control of insect pests.

Soil.

The texture of the soil on which tobacco is grown exerts a marked influence on the quality of the product, which varies from a thick gummy leaf on heavy soils of high clay content to a light chaffy leaf of indifferent quality on very coarse sandy or gravelly soils.

To produce bright tobacco with a silky elastic leaf of good body and bright uniform colour, such as will command the highest price from manufacturers, a light fine sandy to sandy loam soil is suggested by all authorities. It must be understood that the term light as applied to a soil refers to the facility with which it can be worked, and not to its weight.

The most attractive soils in this category will be found in those carrying upward of 70 per cent. of sand together with silt and organic matter, and a very small proportion preferably not more than 7 or 8 per cent of clay.

Other soils with a little less sand and more silt and clay suggest a heavier cropping capacity, through which, though the average price obtainable for the leaf may be lower, the monetary return due to the increase in yield would be satisfactory.

It is considered advisable, however, that the amount of clay in any bright tobacco soil should not exceed 12 per cent., as a larger proportion will tend to produce leaf that will cure out a dark colour.

Suitably textured soils of granitic or sandstone origin will probably be most abundant in the districts that are climatically suited for the production of bright tobacco in Queensland, but others derived from a variety of rock formations that have drifted or been transported, and from which much of the oxides of iron and fine particles of clay have been leached, may also be found in quantity and equally suited for the production of bright leaf.

Generally the best bright tobacco soils will occur on low ridges and on the lower slopes of hills and mountains. Many of the alluvial deposits on the highest terraces of streams will frequently be found of suitable texture, while at times the sandy

alluvials deposited by streams of little length that drain highlands of sandstone or granite formations will be found quite satisfactory. The alluvials from large creeks or rivers, especially those on low terraces that are or have been in recent times subject to inundation, and especially bottom lands and those of delta formation, are rarely found to be suitable. In these the large proportions of fine silt and clay, together with a high humus and decaying organic matter content, render them far too fertile to produce leaf that would be capable of being cured a bright colour.

Soil Colours.

The brightest coloured soils, suggestive of an absence or extremely low content of the oxides of iron, will not only induce the production of leaf that will retain its bright colour when subjected to heavy pressure—a quality prized by manufacturers—but will tend to yield a higher percentage of the brightest yellow than others darker in colour.

Most surface soils show a more or less darkened colour according to their humus content, while many of the coloured soils may show a deepening in colour with depth due to the leaching of the colouring matter from the surface layers under the rainfall of many years.

With these considerations the colours of suitably textured soils in their relation to the production of the brightest coloured leaf may be suggested in an order of preference as light grey, grey, pale yellow, light brown, or their admixtures, dark grey, pale red, yellow, red, dark brown, dark red, black.

Subsoil.

In districts of comparatively light rainfall in the growing season, such as those of the highlands in the southern portion of the State, a somewhat retentive subsoil at a depth of 15 to 18 in. from the surface is advantageous.

In other districts, and especially those of more tropical latitude, however, where the rainfall during the growing season will average from 20 to 30 in. with liability to falls of 2 in. and upward in a day, the subsoil should be more porous. In these latter districts a deep soil is of advantage.

As with the soil a low content of iron oxide is desirable in the subsoil, one bright yellow in colour being much esteemed.

Drainage.

A well-drained soil is a necessity in tobacco production, excessive moisture in the soil being detrimental to leaf quality and provocative of fungus diseases.

Most bright tobacco soils occur on the crest and slopes of ridges, the drainage of which underground or by open channels will, usually, not offer any great difficulty, especially with storm waters. Seepage, however, is to be guarded against. In many deep soils the water from rain falling on higher levels sinks down to a more or less impervious strata along which it flows to emerge when obstruction is met or the impervious strata rises closer to the surface.

On uncleared land the presence of tea-tree (*Melaleuca* sp.) and grasses, sedges, &c., peculiar to undrained land are a sure indication of saturated soil conditions during the rainy season. The direction of the seepage flow is not always indicated by the contour of the surface, as many instances have been noted where the flow has been across rather than down the slope. Deep open drains in the requisite direction are suggested to guard against soil saturation from this cause. The distance between drains will be suggested by local conditions, but with deep soils the intervals will be greater than with those of lesser depth. A system of tile drainage where possible will be found of great advantage in the production of the highest quality leaf, as the soil is not only thoroughly and expeditiously drained thereby, but its aeration, so necessary for the best development of the plants, is greatly facilitated.

FERTILIZERS.

The friable sandy to sandy loam soils in districts where the production of bright tobacco is recommended cannot, from their high content of silica, be regarded as other than infertile. They can, however, be expected to make a ready response to the application of a suitable fertilizer.

While in the virgin state it is possible with some of the sandy loams to secure a payable crop without fertilizer, the application of a suitable quantity will not only increase the yield but greatly improve the quality of the leaf, and thus induce a greater profit.

The elements of fertility sought in a tobacco soil are nitrogen, phosphoric acid, potash, lime, and magnesia. As a rule, the latter two will be found in sufficient quantity in the soils of districts where the rainfall is suitable for bright tobacco production. In districts of light rainfall they can be expected to occur in greater quantity than in others where a heavier precipitation occurs, since in the latter they would be leached to an extent from the surface layers.

Magnesia is regarded as more necessary in the tobacco soil than lime, as it is an essential constituent of chlorophyll, the green colouring matter of the leaves. Lack of sufficient magnesia is indicated by a poor development of leaf accompanied by a pale yellow colour in the tip, contrasting strongly with that of the remainder of the leaf.

Lime is regarded more in the light of a mechanical agent than a plant food. Its effect is to neutralise the acidity of a soil and to improve the texture of clayey soils by rendering the clay more flocculent, and to make loose soils more compact.

In the form of sulphate, lime is a constituent of superphosphate. Where applications of lime and magnesia are indicated, ground dolomite or magnesian limestone is suggested at the rate of 500 lb. per acre broadcasted as a top dressing. In American practice ground dolomite is frequently used as a filler in making up fertilizer mixtures.

Nitrogen.

Nitrogen hastens and increases leaf production in all plants. In suitable quantity it increases the yield and adds body to the leaf. In the soil it is contained in the humus and decaying organic matter; and is also added to the soil as ammonia in the rain from thunderstorms, which are particularly prevalent in tropical parts during the usual period in which the tobacco crop is grown.

The amount of humus in the soil will be a guide to its application in a fertilizer mixture. It is important when applications of fertilizer are made to the soil that it should not be in excess, neither should it be deficient.

Lack of sufficient nitrogen will result in a lower yield, while the leaf will be thin. This leaf, however, will cure out a brighter colour.

If used in excess it will cause a rank coarse growth of leaf, which will be slow to ripen and difficult, if not impossible, to cure to a colour that could be classed as bright.

In fertilizer mixtures it is advised to make up half the percentage from an organic source and half from an inorganic source; in the former dried blood (red being preferable to black), fish meal, and oil cakes are suggested, while in the latter nitrate of soda is to be preferred of those at present available. Sulphate of ammonia is not favoured, as its action is held to create a brittleness in the web of the leaf.

Potash.

Potash forms between 30 and 40 per cent. of the ash of tobacco plants, which is somewhat more than that revealed in the analyses of the ash of other cultivated crops. Its use increases the yield by inducing body in the leaf, and also tends to improve the burning quality of the tobacco. In sufficient quantity it is also held to render the tobacco plant more resistant to fungus diseases.

In many of the tobacco soils of the State, especially those of granitic origin, the potash content will be classed as fair, but generally its inclusion in a fertilizer mixture in fair quantity will prove of benefit. Sulphate of potash is considered the best source of supply. Chloride of potash should not be used.

Phosphoric Acid.

The percentage of phosphoric acid revealed in the analyses of tobacco plants is less than in that of other commercial crops. Though it does not enter to a large extent in the plants structure, it is of especial benefit in increasing leaf development and in hastening maturity, through which the production of a desirable bright colour is favourably influenced.

When nitrogen is in excess as in soils of high humus content, or when leguminous plants have been ploughed under as a green manure, the application of phosphoric acid in increased quantity is advised to overcome the effect of excess nitrogen by accelerating the ripening of the leaf.

Superphosphate is invariably recommended as the best source of supply.

In all fertilizer mixtures suggested for a tobacco crop in all countries the percentage of phosphoric acid is higher than either that of nitrogen or potash.

In Queensland tobacco soils, especially those of sandy nature, the amount of phosphoric acid is notably low, indicating a larger application than is suggested in other countries where the supply in the soil is, in general, considerably greater.

Fertilizer Mixtures.

The relative proportions of nitrogen, phosphoric acid, and potash in the fertilizer mixture and the quantity to use per acre will be influenced in largest measure by the degree of natural fertility that exists in the soil.

In Queensland, unfortunately, no comparative trials of fertilizer mixtures with tobacco have been carried out from which any reliable deductions could be made, so that the practice in other countries where bright tobacco is produced in large quantities must be considered with due regard to such differences as may be shown in a comparison of average soil analyses and also of climates.

In speaking of a fertilizer mixture it is usual to quote the numerals relating to the fertilizing elements in the order of nitrogen, phosphoric acid, and potash—e.g., 3-8-5 mixture would signify 3 per cent. nitrogen, 8 per cent. phosphoric acid, and 5 per cent. potash.

On the bright tobacco soils in the United States of America heavy applications of fertilizer are made either broadcast or in drills, where it is mixed with the soil before the ridges are thrown up.

Until recently a 3-8-3 mixture was generally recommended, a formula for which, supplied by Mr. H. A. McGee, an American specialist in tobacco culture, who carried out many trials on behalf of the British Australasian Tobacco Association Proprietary in New South Wales and Victoria from 1925 to 1928, indicates the admixture of—

Dried blood, 84 lb.;
Nitrate of soda, 67 lb.;
Dried fish, 166 lb.;
Sulphate of potash, 60 lb.

High-grade superphosphate, 363 lb., and ground dolomite, 260 lb., for each 1,000 lb. of the fertilizer.

This mixture at 750 lb. per acre was used in the exploratory test plots in North Queensland in the 1927-28 season.

More recently the "American Fertilizer," in the September number of 1930, reports the result of a conference of agricultural workers, representatives of fertilizer industries and officers interested in tobacco culture in the United States, held at Oxford N.C., was in agreement on the following recommendations with regard to the use of artificial fertilizers for tobacco culture on all average American soils:—

> "For the growth of bright flue-cured tobacco on heavy or more productive soils, 800 lb. to 1,200 lb. per acre of 3-8-5 mixture was recommended. On the light or less productive soils 4-8-6 mixture was preferred. In these fertilizer mixtures the nitrogen to be supplied is at least one-fourth by nitrate of soda, one-half by high-grade organic material like cotton-seed meal, fish, or meat meal, the remaining one-fourth by urea or other inorganic sources. Phosphoric acid must be in form of high-grade superphosphate. Potash is used in the form of high-grade sulphate which should not contain more than 2 per cent. of chlorides. In many cases the addition of magnesia may be a great advantage, and the mixed fertilizer should supply 2 per cent. of magnesia. Part of the fertilizer can, with advantage, be supplied as top dressing about three weeks after planting."

Allowing 1,000 lb. per acre as an average application, 30 lb. and 40 lb. of nitrogen, 80 lb. of phosphoric acid, and 50 lb. and 60 lb. of potash would be supplied respectively with each mixture.

In Rhodesia, where bright tobacco production is an important industry, Taylor, in his book "Tobacco in South Africa" (South African Agricultural Series No. 4) remarks—

> "In Southern Rhodesia heavy applications of fertilizer have not given the most profitable results. It has been found that an application of 150 lb. per acre of what is known as a double complete fertilizer will produce a normal yield without inducing a rank growth, which makes curing difficult and renders plants susceptible to disease. Double complete fertilizer is made up of water soluble components as follows:—Nitrogen, 8 per cent.; phosphoric acid, 20 per cent.; potash, 10 per cent. If lower-grade fertilizers are used the bulk is increased proportionately."

Allowing an application of 150 lb. per acre of this fertilizer, 12 lb. nitrogen, 30 lb. phosphoric acid, and 15 lb. of potash would be supplied. This application would be applied in small quantity, slightly less than half an ounce, at the spots where each plant is to be grown.

American practice it will be noted suggests application over a very much larger area.

In a comparison of the analyses of such bright tobacco soils as are available from America and Queensland respectively, it is noted that on the average the supply of phosphoric acid and potash is lower than that of lime and magnesia higher in those of Queensland origin.

In a comparison of climates and seasons of growth in the three countries there is a close similarity between those of Rhodesia and Queensland. The degrees of latitude embraced in Rhodesia are from 11 to 22, while in Queensland they are from 11 to 29. The growing season of the tobacco crop is practically the same in each country. In Rhodesia, however, the very much higher altitudes suggest cooler temperatures, especially at night, and a generally lower soil temperature than would be expected in Queensland except, perhaps, on the southern highlands.

The applications of the mixed fertilizer generally recommended in Rhodesia could probably be followed with advantage in Queensland. Viewing, however, the apparently lower average content of phosphoric acid and potash in Queensland soils, it is thought that a 4-12-6 mixture would prove more suitable.

A fertilizer such as this could be compounded by the admixture of 15 lb. dried blood (13 per cent. nitrogen), 13 lb. nitrate soda (15 per cent. nitrogen), 60 lb. high-grade super. (20 per cent. phosphoric acid), 12 lb. sulphate of potash (50 per cent. potash), for each 100 lb.

An application at 300 lb. per acre would supply 12 lb. nitrogen, 36 lb. phosphoric acid, and 18 lb. of potash per acre, which compares favourably with the 12-30-15 of the Rhodesian application.

The application of fertilizer to a tobacco crop should be calculated to produce a moderate growth, in which the leaf quality would be improved, rather than to induce a heavy growth by which quality would be sacrificed.

It is suggested that applications of the 4-12-6 mixture might be tried at 200 lb. per acre in the case of the more fertile sandy loams to 500 lb. per acre on the sandy soils that have been previously cropped.

On virgin sandy soils probably 300 lb. per acre would secure a satisfactory return.

In applying the fertilizer it will be advisable to either apply the quantity for each plant and mix it with the soil at the spot where it is intended to set out the plant, or to apply it with a fertilizer drill, so that it will be mixed with the soil immediately under the centre line of the ridge in which the tobacco is to be planted.

Fertilizer should be applied some days before transplanting is effected, so that by becoming dissolved in the soil water it will be more evenly incorporated with the soil and rendered immediately available for the plants use.

In order to arrive at an early conclusion as to the suitability of the application for his particular soil, it is suggested that the grower should experiment with increased quantities on small areas in order to note if increase in yield is commensurate with quality and colour.

ROTATION OF CROPS.

In farm practice the value of a rotation of crops, or what might be more correctly defined a diversity of cropping, as particular crops would not necessarily be grown in regular sequence, is generally recognised.

It is a matter of common observance that crops grown in succession on the same soil show not only a decline in yield but frequently a lowering in the quality of such yields. Under natural conditions also it is often observed that a particular weed that has overrun the soil in one season may be almost, if not entirely, replaced by one of another kind in a season shortly following. It is now generally conceded by scientific agriculturists that such lessened production is due not so much to the depletion of the elements of fertility in the soil as to the presence of matter from the decay of plant tissues or from excretions of the growing plants which poison the soil for plants following which are similar in kind.

A change of crop is especially valuable in overcoming or preventing a trouble of this nature, since it has been found that the excreted matter of one plant is not

necessarily objectionable to that of another kind, also that different species of plants aid in the destruction and removal of deleterious organic substances from the soil.

Another advantage to be obtained from change of crop lies in minimising the risk from plant diseases. Fungus parasites, as is well known, reproduce from spores which will lie dormant in the soil for a certain time. A slight infection in one season will thus in all probability be greatly increased in that following if the same crop is grown. Fortunately the parasitic affections peculiar to one plant are generally inocuous to another of a different kind, so that when crops are varied opportunity will be given for the parasite to perish for lack of a suitable host.

The practice of a dry fallow between tobacco crops, such as will be imperative from lack of rain in most bright tobacco districts, will act somewhat in the same direction as a change of crop. The soil, however, should be ploughed immediately after the crop has been removed, so that it can be well aerated during the time that will elapse before preparation for the next crop is necessary. Maintenance of the organic matter in the soil is of great importance in successful tobacco production, not only from the amount of plant food available therein but on account of its mechanical effect.

Decomposed organic matter or humus renders the soil less liable to extremes of temperature, and also renders it more easily worked, while its spongy nature assists in the retention of moisture. The generally superior quality of tobacco leaf produced on virgin soils is recognised as due to the larger amount of humus then contained. Bright tobacco soils, from their generally infertile nature, seldom possess a high humus content. Under cultivation, as well as when fallowed, the supply will be rapidly lessened, while the action of termites (white ants) and other soil dwellers can be calculated to appreciably hasten this depletion. It is imperative, therefore, to ensure the most profit from tobacco production that the depletion of organic matter in the soil should be remedied by the turning under of a growing crop at least once in three years on sandy soils, and probably once in four years or five years on a sandy loam.

A choice of crops to grow in succession to tobacco from which some profit is derivable is necessarily limited by the texture and general infertility of the soil under use.

Grain and fodder crops will be required for domestic use, and possibly portion of the crop could be marketed. Sudan grass for hay and non-saccharine sorghums for grain should prove of most value in this direction.

Cotton, broom millet, and peanuts are also indicated as avenues of profit. Crops to plough under as a green manure are suggested in velvet beans, cowpeas, and field peas, the first mentioned being considered most serviceable. All green manure crops should be ploughed under during the wet season to ensure sufficient soil moisture to allow their early conversion to humus.

Suitable crops rotations that might be adopted after a virgin soil has grown two successive crops of tobacco are suggested as:—

3-year Rotation.

1st year, legume to be ploughed under;
2nd year, sudan grass, grain sorghum, broom millet;
3rd year, tobacco.

4-year Rotation.

1st year, cotton, broom millet, or peanuts;
2nd year, legume to be ploughed under;
3rd year, hay or grain crop;
4th year, tobacco.

Other crops will probably be found more suitable in certain climates than some of those mentioned, but provided the crop is different the same benefit can be expected.

VARIETIES.

A considerable number of tobacco varieties are listed as suitable for the production of bright leaf, but until comparative trials have been made in the different districts it will not be possible to indicate those that could be expected to give the best results. The uniformly good results, however, with Hickory Pryor and Warne wherever tried enables them to be recommended, the former preferably for sandy soils and the latter for sandy loams or soils of somewhat heavier texture.

TOBACCO SEED.

One of the most important factors contributing to success in tobacco production is the use of seed that will not only give a satisfactory percentage of germination but produce strong healthy plants capable of yielding a desirable number of leaves which in size and quality will be typical of the variety.

The tobacco plant, perhaps more than any other, is subject to variation, particularly under a change of environment in which both soil and climate may exert an influence. In order to ensure that a variety will grow true to type it is important that the seed for its propagation should be selected from acclimatised plants exhibiting the typical characteristics that denote its value.

Carelessness in the selection of seed plants can be expected to result in a more or less rapid deterioration of the crop, both in yield and quality of leaf, while with the exercise of due care quality can not only be maintained but yield materially improved.

In the selection of plants for seed purposes it is advisable to go through the crop when it is about half-grown and mark off a much larger number of plants than are actually required so that a further selection can be made from these at a later period in growth.

The plants selected in the first instance should be typical of the variety, showing a reasonably vigorous and uniform growth with similarly coloured leaves of desirable texture with fine veins and small mid rib. The leaves should not be spaced so closely on the plant as to render suckering difficult, neither should they be too far apart.

When the flower heads have appeared, but before any blossoms have opened, these selected plants should be again carefully examined, and those showing the greatest uniformity in development while still retaining the desirable characteristics retained and the balance excluded.

With the second selection allow one or two flowers to open on the flower head, snip these off with a knife or scissors together with all flowering branches excepting the three or four at the top, at the same time remove the top leaves down to where the plant would otherwise be topped.

To ensure that there will be no possibility of cross fertilisation a 12 or 14 lb. manila paper bag such as grocers use should now be inverted over the flower-head and tied closely round the stem of the plant, but sufficiently high so that further growth of the flower-head will not be impeded.

The paper bag should be removed once a week to inspect the seed-head, when if any insects or their larvæ are noticed a light dusting of arsenate of lead powder should be given and the bag replaced.

When about eighty capsules have been formed the remaining unopened flowers and secondary shoots should be removed, as the whole strength from the plant needs to be concentrated in the fullest development of the seed already formed.

Careful note should now be taken of the manner in which the leaf ripens on the seed plants, and those finally selected that show the most uniformity in this direction, and the remainder topped and the seed-heads destroyed. Leaf should not be picked from the plants finally selected.

When the eighty or so capsules left on the seed-heads of the finally selected plants have all turned brown the seed-heads with a foot of the stem should be cut from the plant and with the paper bag still attached suspended head down in a warm and dry place until they are quite dry.

When proceeding to thresh out the seed it will be found that a quantity will have been shed or shaken out in handling and caught in the paper bag.

This should be placed on one side, as it will be cleaner than that later collected when the capsules are cut across or broken. After the seed has been secured it should be carefully cleaned of foreign matter by sifting and winnowing.

Seed Grading.

As with other crops, the heaviest of tobacco seeds can be expected to produce the most vigorous and profitable plants. As the seed threshed out will naturally show a variation in size, it will be advisable to dispense with those lightest in weight.

The separation of the heavy seed is most easily accomplished by the use of a tobacco-seed grader. This is a simple apparatus the parts of which may be purchased at no great cost from dealers in chemical supplies. They consist of an ordinary foot bellows, 3 feet of ¼ inch rubber tubing, one 3 inch piece of ¼ inch glass tube, 3 feet

of inch rubber tubing, one glass tube 1 inch diameter, 6 inches long, and two glass tubes each 4 feet 6 inches long by 1 inch in diameter, and a large cork bored to receive the ¼ inch glass tube. This cork should fit into the inch glass tube.

In assembling, the ¼ inch tubing is attached to the bellows and to the short piece of ¼ inch glass tube, the other end of which is inserted in the cork stopper, covered with a piece of fine muslin which is fitted into the end of the 6-inch length of glass tube. This glass tube will form the seed receptacle, the fine muslin being necessary to keep the seed from passing into the rubber tubing. The seed receptacle is now connected by a short piece of inch rubber tubing to one of the 4½ feet pieces of inch glass tube placed vertically. The other end of this glass tube is connected to the second glass tube similarly placed but a foot distant by a 15-inch length of inch rubber tubing, and the balance of this tubing connected to the bottom end of the second glass tube to convey the rejected material to a receptacle.

In operation a quantity of seed is placed in the seed receptacle and the bellows worked with the foot to create a current of air which will pass through the tobacco seed. The heaviest seed will be suspended in the air current and the lighter seed with dust or other foreign matter will be carried over the top of the first glass tube into the second one and be caught in the receptacle provided.

As the seed will be visible in the glass tube the current of air can be regulated so that all the seed will not be carried over. With a little practice, or by passing the light seed through a second time, the seed can be very nicely graded.

Another method of separating the heavy seed will be through its rate of subsidence in water. When the seed is placed in water it will all float; it should be stirred round for a minute or so in order to become well wetted and then allowed to stand. The heavy seed will soon sink to the bottom, while the light seed will continue to float and can be poured off with the water and discarded. The heavy seed is now collected and dried immediately, when it can be stored away. Separation in this manner, however, it is considered will be best effected when the seed is to be sown.

Storage of Seed.

Stored under proper conditions tobacco seed will retain its vitality for upwards of ten years. Under unsuitable conditions, however, loss of vitality may occur within a year.

Amber-tinted or blue glass bottles make very suitable containers, as the passage of certain light rays which would affect vitality would be prevented.

The bottles of seed should be corked and stored in as cool and dry an atmosphere as possible.

A method of storage practised by some cigar-leaf growers in North Queensland which proved very effective was to place the seed in pickle bottles which were well corked and then buried in a box filled with dry sand.

Seed Treatment.

In the control of disease the first essential is the use of disease-free seed. While that saved on the holding will naturally be from plants free of any sign of disease there is always a possibility of a slight infection having passed unnoticed. Where seed has been purchased also, unless known or guaranteed to be free from disease, there is a possibility of some infection being carried.

A simple treatment of the seed occupying only a little space of time is a precaution against disease that might well be adopted by all tobacco growers.

Two formulas can be recommended:—

(1) A corrosive sublimate (bichloride of mercury) solution of 1 part in 1,000 parts of water.

Place the seed in this solution and keep it well stirred for five minutes; allow seed to settle, pour off the liquid, then wash the seed in six changes of rain water; spread and dry in the shade.

(2) Dissolve 9 grains of silver nitrate in a pint of water.

Place the seed in this solution and keep it well stirred for fifteen minutes, then drain off the solution and wash the seed in six changes of rain water; spread and dry in the shade.

(In connection with the treatment of seed for blue mould control, the reader is referred to Mr. Mandelson's notes thereon in his contribution on tobacco diseases.—Ed.)

CULTIVATION.

Ploughing.

When practicable, the land should be ploughed immediately after the previous crop has been removed, and allowed to stand until shortly before the time for planting arrives, when it should be reploughed and well harrowed to bring it to a fine degree of tilth.

In the case of newly cleared land, or land that has been under grass for some time, ploughing is indicated, in the wet season, to allow of the vegetation turned under being converted to humus.

An early ploughing allows a thorough aeration of the soil, which is thus rendered more friable, while it also tends to eradicate weeds and diminish insect pests.

Depth of Ploughing.

Land should not be ploughed to a greater depth than that to which the humus and decaying organic matter obtains. On most bright tobacco soils in Queensland other than those of alluvial formation the depth to which this occurs is usually from 5 to 7 inches. Ploughing to a greater depth on these soils is not only unnecessary, as the soil below that depth is sufficiently loose to allow of root penetration, but harmful, as the humus comprising the most fertile part of the soil is buried below the reach of the main feeding roots of the plants and less fertile soil placed on top.

If the soil below 6 inches from the surface is so compact as to suggest deeper ploughing, a subsoiler should be used or, better still, the land devoted to another crop.

The value of humus in the soil cannot be over-estimated. Its presence in more or less quantity assures a certain supply of nitrogen and other elements of plant food as well as the action of those soil micro-organisms so necessary in the desirable growth of plants.

Soils with a fair humus content are rendered more friable, capable of a better retention of moisture, and preserve a more uniform temperature. It is an accepted fact, also, that in the absence of sufficient humus artificial fertilizers are unable to exert their best effect.

Ridging.

After the soil has been thoroughly prepared it is advisable to throw up ridges to a height of from 4 to 8 inches at desired intervals on which to set out the plants. Planting on ridges is strongly advised in districts where heavy falls of rain are likely to occur, in order to provide additional drainage and to prevent the young plants from being washed out or covered by soil from storm waters. On shallow soils the higher ridging is indicated, but where the soils are 12 inches and upwards in depth and the field is satisfactorily drained 4 or 5 inches is regarded as sufficient. As a rule the ridges should run in a direction to assist drainage, but care should be exercised where the slope is well defined to see that no erosion of the soil will take place when the storm waters are running off. Erosion can be expected where the fall of the channel is in excess of 1 in 300.

Ridging is satisfactorily effected with a light plough, disc cultivator set to throw the soil inward, or an ordinary scuffler fitted with hilling attachments. A disc cultivator with wheels whereby the depth of the cut can be regulated will find favour.

As fertilizer will be applied in almost all instances, a saving of time and labour will be effected by attaching the fertilizer distributor, such as that of a corn-planter, in front of the implement used for hilling. No doubt a compact machine to effect both operations will ere long be purchasable.

Spacing of Plants.

The distances between plants when set out will be regulated to some extent by the growth that may be expected and the employment of hand labour or machine in cultivation.

Where machine cultivation is to be practised the ridges should be 4 feet apart, and if normal growth is anticipated the plants spaced at intervals of 2 feet thereon. Under this spacing one plant will occupy 8 square feet, 5,445 plants being required for the acre.

Where the soil is naturally fertile and a large growth of plant expected it is sometimes advisable to set the plants out at intervals of 21 inches to secure a better textured leaf. At this interval one plant will occupy 7 square feet and 6,222 plants be required for one acre.

With a lesser space between rows, as is sometimes advocated where cultivation is effected by hand, there is, unless the plants make small growth, a danger when bending down in the act of removing suckers from one plant of breaking or otherwise damaging leaves or plants in the next row.

Five thousand plants are usually regarded as an indication of one acre.

Where the field is large and the rows of plants a good length it may be advisable, at intervals, to miss a row or to make the distance greater between two to allow the passage of the vehicle used during harvesting operations for transporting the leaf to the barn.

TOBACCO SEED-BEDS.

The production of strong healthy plants, free from disease and insect infestation, that will most easily bear transplanting to the field and there make satisfactory growth is a prime factor in successful tobacco leaf production.

Not only will such plants make better growth and reach a more even maturity, but they will through their unimpaired vigour offer a greater resistance to attack by disease than would others less well grown.

Soil.

A tobacco seed, being exceedingly small, can provide but a small amount of nourishment for the young seedling, which in consequence is soon forced to draw its food from the soil. In view of this and the foregoing a friable fertile soil of fine texture, with a good humus content, capable of easy reduction to a fine tilth, should be selected for the seed-beds. A sandy silt loam or a fine textured alluvial or other loam is considered very suitable.

Where such a soil is not available on the holding, the existing soil can be built up by the addition of fine sand or heavy soil, whichever is called for, to improve the texture, and by the addition of well-rotted organic matter, either as leaf mould or animal excreta, or both, to improve both texture and fertility. In the case of the latter addition it should be well dug in some time before the seed-beds are required in order to become thoroughly incorporated with the soil.

Drainage.

Good drainage is imperative for tobacco seed-beds, since the seedling plants will not make a satisfactory growth on wet soil and will also be liable to damage from fungous diseases so engendered.

Site.

The situation of the seed-beds should be as sheltered as possible from strong winds, which are apt to damage the coverings (alluded to later on) and to dry out the soil. It should be such as to allow of easy drainage, if such is not naturally provided, and convenient for ease of access and attention. Proximity to a permanent supply of water is of the utmost importance. Tree growths should not be close enough to cast their shade on the beds, or through their roots rob them of food or moisture.

Area.

In calculating the area of seed-bed required, though it is usual to allow 100 square feet as sufficient for each of the acres it is intended to plant, a surplus of 50 per cent. is considered advisable, to allow for eventualities.

It is also advisable to make two sowings at intervals of two or three weeks in case sufficient rain does not fall to allow of setting out the first-raised plants before they are too old. It is considered inadvisable to set out in the field plants that are older than eight weeks. Plants four to six weeks old are much to be preferred.

Size.

The seed-beds may be formed to any desired length, but they should not be of greater width than will allow ease of weeding or of lifting plants preparatory to transplanting. A satisfactory width for such purpose is 3 feet, with a distance of 2 feet between beds to make provision for pathways. The width of 3 feet corresponds with the width of butter muslin or cheese cloth, which material is regarded as very suitable for covering purposes.

Preparation.

The land, being first cleared of all surface growth, should be thoroughly pulverised by ploughing or spading to a depth of 5 or 6 inches, and brought to a fine tilth. The seed-beds should now be marked out by drawing drills at intervals of 5 feet to make the breadth of beds, and across these at such intervals as the length of beds is desired.

These drills should be the depth of the ploughing and approximately 18 inches wide, the soil therefrom being thrown back and spread over the beds thus formed. A double mouldboard plough is very suitable, or an ordinary plough used as when making a finish. The beds will thus be 3 feet 6 inches in breadth, which will allow of the framework enclosing the 3 feet to be seeded resting thereon.

Sterilising.

Before further preparing the seed-beds for sowing, the soil should be sterilised. There are several methods of doing this, such as by steaming, the application of boiling water, solutions of formalin or similar agents, but the most effective in general estimation and recommended for Queensland growers is by the application of direct heat from the firing of tree branches, brushwood, or similar heat-giving material, piled on the beds, to such an extent as will, when fired, produce sufficient heat in the soil to cook a 4-oz. potato buried 3 inches deep, or an egg buried 5 inches deep. It is difficult to state the exact amount of material for burning purposes, but the equivalent of poles 3 inches in diameter laid side by side is regarded as likely to prove satisfactory. Successful sterilisation of the soil is most readily accomplished when the amount of moisture therein is what is regarded as satisfactory for cultural operations. Excess of moisture is as undesirable as a deficiency, since in either case the penetration of the desired heat in the soil is less easily permitted.

Properly burnt beds show a more or less reddish tinge of colour, while the soil is rendered more friable and breaks easily to a fine powder. The object of burning the beds as well as the soil for a couple of feet surrounding them is to destroy any fungus spores, weed seeds, insect or other life therein, that may cause damage to the young plants.

Another effect of burning the soil is to render the nitrogen content more readily available, and in other directions, probably to exert an improvement in growth thereon. The addition of the ash from the material burnt also tends to increase fertility.

Time to Burn.

The time to burn the seed-beds is preferably a few days or a week before it is desired to sow the seed.

Final Preparation.

After the fire has burnt out and the soil is sufficiently cool, all unburnt pieces of wood and large charcoal should be removed, and the beds and paths, disarranged when placing the firing material thereon, trimmed up to proper shape. The fine ashes from the firing should now be thoroughly incorporated with the soil of the seed-beds, which at the same time should be reduced to the desired degree of fineness by digging and raking, back and forth, to a depth of 3 inches and finally levelled off.

Framework.

It is necessary for tobacco seed-beds, more especially in North Queensland, to be shaded when the seed is germinating, as the heat from the direct rays of the sun is apt to scorch the young seedlings; it is also advisable for the seed-beds to be protected against the ingress of insects which would be likely to cause damage. To satisfactorily effect this latter and to allow of the covering used for shading not interfering with the growth of the plants, a frame or box with sides 6 or 7 inches high should enclose the beds. An adequate frame can be made of boards 6 or 8 inches wide; the ends if these should be squared so as to fit closely at the joins, over which a short piece of board or sheet iron could be nailed and at the corners, when the boards could be nailed to each other and further protection afforded by sheet iron, such as a piece of a petrol tin fixed to enclose the right angle so formed.

The top of the frame should be even, so that the covering will fit closely, and the boards should be sunk 1 inch or so in the soil and the soil on the outside heaped against them.

Protection against the ingress of insects is regarded as most important since the setting out of plants in the field free of infestation, either in the form of eggs or larvæ, must be regarded as a distinct advantage. Other types of framework can be considered for use, but the main essential to be observed, while allowing for support of the shading, is to have them so constructed as to allow insufficient space for the entrance of even very small insects when the covering for shade is applied. The breadth of the framework should be commensurate with the width of the covering material used so as to allow ease of attachment. With material 1 yard in width a breadth of 3 feet overall is suggested as a limit.

Covering.

Provision for sufficient light and the circulation of air in the seed-bed is necessary for the successful growth of plants. Choice of material for covering, especially in North Queensland, suggests consideration being given not only to a protection against the direct rays of the sun, which at the time of seeding is vertically overhead or nearly so at midday, but against storms of rain likely to occur while the plants are being raised, which would tend to damage the young plants or to wash them out. Glass is probably the most effective all-round covering, but would require to be shaded during the hottest part of the day. The initial cost, in the first instance, would be considerable, but where operations are on an extended scale it will be likely to prove most economical over a period of years.

Cheese-cloth or butter muslin, purchasable at comparatively small cost per yard, secured across the framework usually make a very satisfactory covering, but can be further improved by the addition of hessian, calico, or canvas placed tentwise or with sufficient pitch to run off heavy rain a little distance above.

When placing the covering, of whatever nature, on the frames, provision should be made for its easy removal when watering, or otherwise attending to the plants. Loops of tape sewn to the edges of the material to slip over nails or hooks on the outside of the frame, with wires drawn taut or supported at intervals across or along the beds to prevent sagging, will be effective, but perhaps the most satisfactory will be to attach the material to the underside of pieces of lath placed at intervals across the breadth of the frame, with one at each end overhanging to keep the material stretched. The covering can thus be conveniently lifted or rolled back and as easily replaced.

Fertilizing Seed-Beds.

When the soil is of low fertility or it has not been practicable to enrich it by the previous addition of manure the application of a little fertilizer is suggested. In this connection it would be advisable to make use of a complete fertilizer, of which a suitable mixture would be 6 parts superphosphate, 3 parts of nitrate of soda or dried blood, and 1 part of sulphate of potash, applied at the rate of 1½ oz. per square yard of seed-bed.

Where the beds have been burnt, however, there should be sufficient potash supplied in the ash from the firing, when a satisfactory application will be superphosphate at the rate of 1 oz. or a heaped tablespoonful evenly dusted over every square yard. Nitrate of soda could be added at the rate of ½ oz. per square yard applied in solution by a watering can. Fertilizer should preferably be applied the day before sowing, and brushed rather than raked into the surface of the soil.

Rate of Seeding.

Tobacco seeds being so very small induce a tendency to sow too heavily. An ounce by weight will contain approximately 300,000 seeds, which quantity will fill a teaspoon to its level twelve times. A level teaspoonful will thus contain about 25,000 seeds, which quantity is regarded as ample for 100 square feet of seed-bed unless the seed is known to be of low vitality. A heavy seeding results in a crowding of plants, which consequently make a spindly growth; another bad feature is that such crowding prevents the access of air and light to the soil, thus inducing the production of fungus diseases.

Time to Sow.

The time for sowing the seed-beds will be regulated by a knowledge of the seasonal conditions usual in the district, the object being to have plants four to six weeks old when sufficient rain has fallen to ensure growth after transplanting. The best quality of leaf is grown during the warmest months of the year.

In North Queensland, where the rainy season usually commences in December, it is advisable to make sowings in the second and fourth weeks of November. It takes from seven to ten days usually for the seed to germinate; old seed sometimes taking up to fourteen days or longer. Seed thus sown can be expected to provide plants for setting out from mid-December to mid-January.

Sowing.

It is probable that the soil at the time it is desired to sow the seed-bed will be rather dry; if this is the case a good watering is indicated a day or so before the seed is sown, since a heavy application immediately afterwards is not desirable.

When the moisture content is satisfactory the surface soil should be broken finely and then slightly compacted, as by the pressure of a board, to prevent an even and level appearance. To secure an even distribution of the seed over the seed-bed will be extremely difficult unless some medium is used. In South Africa success is reported by distributing the seed, suspended in water by agitation, from a watering can with a fine rose. The usual method, however, is to mix the seed very thoroughly with fine, dry, sifted ashes, using 1 quart to that for each 100 square feet. In mixing, it is advised to take a bucket or similar receptacle and place a layer of ashes in the bottom then sprinkle a pinch of seed over it, then another layer of ashes followed by a pinch of seed until the desired amount has been used up. The ashes and seed should now be thoroughly mixed with the hands and then by pouring from one bucket into another several times. By broadcasting this mixture over the bed the colour of the ashes will give an indication of the evenness of distribution. After the seed is thus sown it should be lightly pressed into the soil. This is nicely performed by the use of a board to the centre of which a handle has been vertically fixed. Some growers prefer to add a mulch after sowing, in which direction dried and finely-teased horsedung is very suitable as it forms a mat over the soil, which prevents disturbance of the seed when watering and is easily penetrated by the young seedling. It is advisable, however, in preventing the introduction of weed seeds or fungus spores to sterilise this material by contact with boiling water or steam for ten minutes or so. Tobacco seed should not be covered too deeply, as germination will thereby be retarded, if not prohibited, consequently any form of mulch used to cover must be in a very thin layer.

Watering.

Immediately after seeding, the beds should be lightly and evenly watered and kept damp but not wet whilst under shade. A watering can with a finely perforated rose can be used, but a hose with a nozzle capable of giving a fine spray under pressure, such as would be obtained with water laid on from an overhead tank, would be more satisfactory.

The frequency of waterings will to an extent be regulated by the evaporation, but a light watering in early morning and late evening is preferable to a heavier watering once a day. When the seed has germinated and the plants have made some growth the watering can be effected more rapidly by using a rose with larger perforations on the watering can or hose.

Hardening Off.

Plants grown entirely under shade would be too tender to withstand the shock of transplanting to the field, where bright sunshine would prevail; they should, therefore, be gradually hardened off by removing the covering when they are 1 inch to 1½ inch high for an hour or two in early morning and late afternoon, gradually extending the period until they will bear the direct sunlight all day. The covering, however, should always be on the beds through the night or between sunset and sunrise, as most predatory insects on tobacco plants are night fliers. When the plants are half grown the waterings should be lighter but not enough to allow of the plants wilting.

Added Precautions.

As a preventive against fungus diseases the young plants can be sprayed with Bordeaux or Bungundy mixture, diluted to three-quarters the usual strength, to which might be added arsenate of lead, especially if grasshoppers are in evidence, as a protection against insect attack. A spraying with arsenate of lead or Paris green the day before the plants are lifted for setting out in the field will afford a further protection and is recommended.

Should the plants not be making satisfactory progress in the seed-bed, or it be necessary to accelerate their growth, the application of a liquid manure is advisable.

This can be prepared by half filling a cask or similar vessel with cow, horse, or fowl dung, the lastnamed being regarded as the best, and then filling up with water. After a few days, during which the contents should be stirred occasionally, the liquid can be used when diluted with nine or ten times its bulk of water to water the beds.

TRANSPLANTING.

The plants in the seed-beds having grown to a height of from 4 to 6 inches, and a sufficiency of rain having fallen or irrigation been applied to secure a desirable amount of moisture in the soil, transplanting to the field may be undertaken.

Before drawing the plants the seed-beds should be thoroughly moistened to allow ease of lifting with as little damage to the root system as possible. Should the soil be insufficiently loose after this has been done, a thin, flat piece of wood about 1 inch wide, or something similar, should be inserted near the selected plant which will be loosened by gently prising under it.

The stockiest and best plants of as uniform size as possible, with broad leaves, should be selected and lifted one at a time. The tips of the two largest leaves should be held between thumb and forefinger above the bud, and the plants gently lifted with as much adherent earth as possible and placed in a basket or other receptacle with the roots resting on a wet bag or in a slurry of soil and water, the container when filled being covered with a wet cloth until the plants are dropped in the field.

It is important when transplanting from seed-bed to field not to bruise the stem or in any way to injure the growing bud, the bruising of the tips of the leaves is of no consequence as they will not in any case come to harvest.

Whenever possible the plants should be set out the same day as they are lifted.

After the plants have been selected from the seed-beds another good watering should be given to set the smaller plants disarranged when lifting the selected ones, and the shades placed over the beds until they are again established.

It is not considered advisable to set out plants that are small and tender, though success might be achieved if the days following were dull and cloudy with occasional showers. The stocky plant with a firm stem is much to be preferred as it will be much hardier, take root sooner, and make a much more satisfactory subsequent growth.

As evenness in growth of leaf to maturity is most desirable in successful tobacco production, it is advisable to have the plants, as far as possible, of uniform size and age for each planting.

Where the operation of transplanting is accomplished by hand, it is found most satisfactory to have one person dropping the plants at the proper intervals on each of two ridges with two others immediately following to plant them. It is advisable to drop two plants on each ridge at the start so that the planters will each have a plant in hand to replace a defective one if necessary; this extra plant will also be found to facilitate planting.

An ordinary gardening trowel, or a dibbling stick or round peg 8 or 9 inches long and about 1½ inch in thickness, tapered roundly to a point, is generally used to make the hole in which to set the plant to the desired depth. Deep planting is desirable in order to allow the roots opportunity of securing moisture should the surface of the soil dry out, and as a protection against a scorching of the stem by a hot sun; care, however, should be exercised to see that there would be no likelihood of the growing bud being covered with soil should heavy rain be experienced before growth is made. In general, a planting to a depth that will allow the base of the two large leaves to appear level with the surface will be satisfactory.

Should the tap-root be so long that it would be bent up when the plant is set in the hole it should be nipped off.

After the plant is set in the hole the soil should be firmed round the roots and stem by inserting the peg at an agle nearby and pressing the soil in towards the plant, being careful especially to firm it around the roots.

If the soil is in good planting condition when the plants are set out, and the days are dull and cloudy or rain falls shortly after, the plants will soon take root and commence growth. They will generally wilt during the day if the sun is shining, but if in the early morning they look fresh they can be expected to do well.

Two or three days after setting out plants that are going to fail can usually be detected. These should be replaced as soon as possible with larger plants, if available, than those first set out, to secure uniformity. Where the number of replacements are not too many a little water should be given to each as they are put out.

When conditions are not very favourable at the time the plants are set out a protection should always be given against the effect of the sun by shading the transplants with a wisp of grass laid over each, a leafy sprig of bush stuck in the soil alongside, or pieces of paper placed tentwise over the plants and kept in position by weighting the edges with earth.

Machine Planting.

An expeditious and very satisfactory method of setting plants in the field will be found in the use of a transplanting machine. There are two makes of planting-out machines on the market. The "Bemis Transplanter," made by the Fuller and Johnson Manufacturing Co., Madison, Wisconsin, U.S.A., and a similar machine manufactured by Albert Smith, engineer, Wangaratta, Victoria.

These machines are drawn by two horses, and require one man to drive and two men or boys to drop the plants. One row is planted at a time, and up to 6 acres a day can be completed, the amount being governed by the ready supply of plants and water and the skill of the droppers.

A barrel of water is carried on the machine, while the planters are seated at the rear close to the ground with the drill opener and closer between them. From a box in front of each the plants are set alternately or handed by one to the other.

The machine can be regulated to allow of planting at desired distances, a warning being given to set the plant in the opened furrow as a small supply of water is delivered at the roots, around which the soil is immediately compacted by the drill closer.

The use of this machine will permit of the setting-out of plants in drier lands than would be permissible in hand planting.

It is not advisable to use the machine, however, when the land is very dry or very wet, as in the former the strike would be endangered and in the latter the compaction of the soil, caused by the heavy wheels from which the watering mechanism is driven, would be too great.

Cultivation.

After the plants are set out in the field the soil immediately around them, unless to break the crust for 1 inch in depth, should not be disturbed for about ten days or until they have become established, though if advisable a scuffler could be run between the rows without however coming close to the plants.

After the plants are well established shallow inter-row cultivation should be practised, and the soil kept loose between and immediately around the plants to aerate the soil, conserve moisture, and keep down any weed growth.

As the plants grow a little soil should be drawn towards the stems at every scuffling and a furrow formed midway between the ridges; the furrow thus formed, however, and the cultivation at any time, should not be deeper than the ploughing. This will allow the top of the ridge on which the plants are growing to be 9 or 10 inches higher than the bottom of the furrow between the ridges which, in a field adequately drained, should disallow any saturation of the soil around the plants, even under an exceptionally heavy fall of rain.

The number of cultivations required will vary according to the soil and season, but they should be so arranged as to keep the surface soil for a couple of inches in a fine, loose condition.

After the plants are topped further cultivation is not desirable.

FIELD WORK.

Priming.

When the plants are about 1 foot high the small leaves lowest down on the plant should be removed; this tends to a better growth of plant and allows a circulation of air below the leaves which tends to the prevention of fungus diseases.

Just before topping, also, it may be advisable to go over the plants to remove the smallest bottom leaves—these besides being small are of poor texture and the nourishment required by them would probably be of greater advantage to leaves of better size borne higher on the plant. The value of the leaf when cured, even when of poor texture, however, may be sufficiently attractive to allow of discrimination being exercised.

Topping.

The operation of topping is the removal of the flowering stem to prevent the formation of seed.

Natures objective being reproduction, the plant as it grows elaborates and stores a food supply in the leaves to be later transferred to the stem and used in the formation of seed. The leaves on a plant that has been allowed to run to seed will be found to have much less body than one nearby that has been topped at the proper time. The object then in topping the plant is to conserve, as far as possible, those products in the leaves that would otherwise be lost to them when transferred to form the seed, and to concentrate further growth in the leaves remaining on the plant so that their size and body will be satisfactorily increased.

A good time to top is when the flower stalks are well up all over the field, with odd ones showing one or two opened flowers. The height at which the stem with a number of small leaves is broken off will be indicated by the growth of plant, and requires some practical illustration or experience in order to gain the correct idea.

Topping too low has a tendency to cause the plant to develop coarse, heavy leaves that are slow to ripen and difficult to satisfactorily cure. Topping too high increases the quantity of short leaf at the expense of body in the other leaf. It is better, however, if uncertain, to top a little high than low, as a mistake in the first direction can be corrected later.

A proper height is suggested as just above the leaf that can be expected to grow into a nice saleable size. According to the vigour of the plant this would leave from six to eight leaves on a poorly developed plant, to twelve or fourteen on one of average growth, and correspondingly more on one of extra vigorous growth.

Seasonal conditions will influence the height of topping, also the plants being topped a little higher in a season of heavy rainfall and a little lower when the precipitations are under average.

Suckering.

The plant being defeated in its first attempt to produce seed now makes a further endeavour by sending out suckers or shoots from the axils of the leaves a week or ten days after topping, which, if left to grow, would produce flowers and later seed. These growths must be removed or the objective in topping would be defeated. Just as soon as they are 2 or 3 inches long the plants should be carefully gone over and each sucker removed. Fresh suckers will continue to form where the others have been broken off until the leaf is harvested. Usually in a normal season three suckerings will be necessary. They should never be allowed to grow too far before being removed, except when a period of wet weather occurs as the leaves are ripening, when they may be allowed to grow temporarily to absorb plant food and prevent the leaves from becoming coarse and difficult to cure.

RIPENING.

There is analogy between the ripening of a tobacco leaf and that of a dessert fruit, of which an orange or apple will afford a good example. As full growth is attained in each, a gradual change in colour will be noted, during transition from greenness to ripeness, which is indicative of the change that is occurring in those components, that determine the ill-flavour in the unripe product and the maximum of palatability in that fully ripe. Just as the stage at which a dessert fruit or tobacco leaf is picked falls short of full ripeness, so will the flavour and palatability, when it becomes ripe or is so cured, fall below that which it would possess if allowed to ripen naturally on the plant.

While the fruit, however, can be left upon the tree to become fully ripe, in which condition it will remain for some considerable time before decay sets in, a similar procedure cannot be followed in the case of the tobacco leaf; this, owing to its comparative thinness and largeness of surface area, must be picked at a somewhat earlier stage and full ripeness accelerated in the curing process, so that deterioration, which is otherwise rapid, will not take place before the desirable qualities can be preserved. It will be noted that when a tobacco leaf is allowed to remain on the plant beyond the stage of ripeness at which it should be picked, the bright yellow colour, suggestive of full ripeness, will commence to show at the tip and gradually spread from there over the blade of the leaf towards the stem. As this bright colour spreads, however, it will be followed by a dark brown colour, indicative of dead tissue or decay, so that before the last part of the leaf has become fully ripe, or so coloured, the first part has perished and become worthless.

Too much emphasise cannot be laid on the fact that the finest flavour and smoking quality of the cured tobacco leaf is due to the natural changes that occur in ripening while the leaf remains upon the plant.

As with other plants, such as maize, sugar-cane, &c., it may be noted that the leaves on a tobacco plant ripen progressively, from the base of the plant upwards. During growth, the leaves on the plant are soft and pliable and characterised by a generally deep green colour; after topping and the removal of suckers the body and size of the leaf increases, due to the accumulation of the plant food that would ordinarily be transferred to build up the seed heads. When the leaf has reached full growth, from smooth and pliable it has become rough to the touch and somewhat brittle, since on folding portion of the leaf with the underside uppermost and pressing it will crack across the fold; this is due to the accumulation of starch granules with other plant food within the leaf cells. Though fully grown this leaf is not necessarily ripe enough to harvest.

In a normal season, from two to four weeks after topping, and, according to the soil, eleven to thirteen weeks after setting the plants out in the field, the lowest leaves should be approaching ripeness.

Just as an orange or apple may be fully developed but not sufficiently coloured to be deemed ripe, so will signs of ripeness in a tobacco leaf be indicated by the change of colour from a generally deep green to a more or less greenish yellow.

The yellowness will be more pronounced in leaves of light texture, while in leaves of heavy texture the yellow may only show in flecks of colour over the surface.

The degree of yellowness, or the amount of departure from the original greenness, will vary according to the soil on which the crop is grown.

In many crops grown on poor sandy soil, the leaf during growth will possess a yellowish tinge, which will become more and more pronounced as ripening progresses.

In crops grown on more fertile soil, or, where the percentage of clay is greater, the leaf will possess more body, in which case the yellowing will be less pronounced, or, as was previously noted, will appear only as flecks upon the leaf surface. These flecks, however, will be accompanied by a general lightening of the original green colour of the leaf.

Close observation of the crop during growth, and of the gradual change of colour as ripeness is approached, will be most helpful, while the depth of greenness during growth will be an index to the degree of yellowness that may be expected when the leaf is ripe.

Probably the best indication of ripeness is the definite change of colour in the blade of the leaf, closest to the stalk of the plant.

Practical experience is necessary to allow of leaf being harvested at exactly the right stage of ripeness, for to secure the best results in flue curing, the leaf should neither be under nor over ripe, though it is better to err slightly in the latter direction than the former.

HARVESTING.

Leaf should not be picked when wet with dew or rain unless it can be immediately strung on the sticks and suspended, for if kept for any length of time in a heap it will probably become discoloured.

After a heavy fall of rain it will be noted that the leaf has lost its gummy feel. Picking should not be resumed until, after a few fine days, the gum has again become apparent.

Two methods of harvesting tobacco leaf can be employed. One is to pick the leaves from the plant, as they become ripe, and the other, to cut the whole plant. The latter method is not recommended, as, although a saving in labour is effected in harvesting, it is more than offset by the extra fuel and attention required during a longer period of cure and a lower average price for the product, since the leaves will be in various stages of ripeness, and so incapable of being cured to the best advantage.

As success in curing depends on having the leaves at a uniform stage of ripeness it is evident that, as they ripen progressively, such uniformity can only be secured by picking the leaves singly.

The number of ripe leaves that can be secured from a plant at one picking will vary; usually three will be found sufficiently ripe, but at times only two will be ready, and not infrequently four, or even six, will be available. Where evenly-sized plants were set out in the field and uniform growth made, harvesting will be facilitated as each plant can be expected to yield about the same number of ripe leaves

at a picking. As these leaves would have occupied the same position on the respective plants they would possess a similar texture, which would be a great advantage in curing.

The number of pickings required to harvest a field of tobacco varies according to the growth of the plants, but usually from three to five will be found necessary.

At all times great care should be exercised in handling tobacco leaf, especially at harvest when the leaf is crisp and easily broken or bruised. As the leaves are picked they are carefully laid, one on top of the other, in suitable containers, or placed in similar fashion across the hand and forearm, from which they are periodically transferred to a vehicle for transport to the barn or stringing shelter. The latter method will probably be found most expeditious, but will be improved if a light shallow tray, or something of like nature, is first supported by the hand to allow a greater resting surface for the leaf. When the container is full and the leaf is transferred to the vehicle for transport to the barn or stringing shelter it should be protected from the sun's rays by a covering of light cloth or hessian. Sunburnt or bruised leaf will not cure a good colour.

Transport of the picked leaf will be facilitated when a wider space has been left between rows at successive intervals across the field to permit of the passage of a vehicle, to which the leaf would be progressively transferred by the pickers on each side.

A slide, about 2 feet wide by 6 feet long, built to carry a removable container of a form somewhat similar to an ambulance stretcher, but with a box-like frame, say 2 feet deep, covered with hessian, replacing the usual canvas, would be convenient.

This container when filled would be drawn on the slide to the headland and there transferred to a wagon or motor lorry built to carry several, so that bruising of the leaf will not occur during transport to the barn or stringing shelter.

STRINGING.

Stringing the leaf is carried on in the shade, either under an improvised shelter in the field where the leaf is picked or in a stringing shed at the barn.

It should be noted that the leaf at all times after picking should be protected against the effect of a hot sun so that it will retain its crispness. Wilted leaf is difficult to cure. In the stringing shed the leaves are placed in piles on benches or tables, with butt ends all one way. A stand with two uprights, each with a slot on top, so spaced as to carry the tobacco stick as a rail, about waist high, is most convenient for tying.

The sticks, which are either 1 inch square or 1 to 1¼ inch round by 4 feet 6 inches long to allow them to rest on the tierpoles spaced at 4 feet centres are arranged in a handy stack.

Ordinary fine counter twine, such as grocers use for small parcels, usually sold in reels, answers admirably for attaching the leaf to the sticks. When tying, a stick is placed on the stand while the reel or ball of twine is placed in a bucket or similar receptacle at the end of the stand to the right.

Two persons, one handing up the leaf and the other attaching it to the stick, will do quicker work than if each acted independently. The one tying takes the end of the string and attaches it to the stick 4 inches from the end at the left; the other hands up the leaves two, three, or four at a time, according to the size, placing them so that the sides with the veins prominent will be facing one another and holding them between thumb and fingers at the extremity of the butts. With the twine held in the right hand, the operator grasps the bunch of leaves 2 or 3 inches below the other's fingers, and placing the stems against the stick, with butts about 1 inch above near where the string is tied, passes the string anti-clockwise round the stems, at the same time giving the bunch of leaves a half twist to make the stems come close together and cause the string to bind tightly; keeping the string taut, another bunch of leaf is grasped in a similar manner, brought over the stick and tied to the side opposite the first, by passing the string clockwise round the stems and giving the leaf the same kind of twist as previously. This is repeated, spacing the bunches of leaf 3 or 4 inches apart on each side of the stick, so that the bunches on one side of the stick occupy a position midway between those on the opposite side, until the stick is filled to within 4 inches of the other end, when the string is tied to the stick by lifting the end and throwing two or three half-hitches over it near the last bunch of leaf and drawing tight.

The number of leaves in a bunch, and the number of such bunches on a stick will vary according to the size of the leaf. Two large leaves, three medium, four

small or more if very small, are usual to form a bunch, while twelve to sixteen bunches can be placed on each side of the stick.

When the stick is filled the operator removes it and lays it carefully down on a bench, while the other places another stick in the stand and ties the string to its end. As the sticks are tied they are stacked carefully to avoid bruising until a sufficient number is available for transference to the barn with least loss of time.

IN THE BARN.

Filling the Barn.

When filling the barn the sticks are usually passed carefully from hand to hand to be suspended between the tierpoles.

The sticks should not be crowded upon the tierpoles as this would induce sponging; depending on the size of the leaf, they would be spaced from 8 inches with small leaf to 12 inches apart with large leaf, the object being to allow sufficient space for the necessary free circulation of air.

A standard 16 by 16 five-tier barn can be expected to hold around 360 sticks of average sized leaf.

Thermometers.

As control of heat and humidity is the essential factor in flue-curing it is necessary that a hygrometer (wet and dry bulb thermometer) as well as a thermometer should be provided, the latter for use chiefly when the higher heats are in operation. Hygrometers on wood backs are procurable from 12s. 6d. upwards—the difference in readings between the wet and dry bulb of the hygrometer will indicate the amount of humidity present. A range up to 130 degrees Fahrenheit is quite sufficient, as this instrument is only necessary in the early stages of the cure.

The thermometer should register to 200 degrees Fahrenheit, with bold figures, and present a broad column, preferably coloured, that will permit of easy reading at a distance.

A "flat wood back black spirit thermometer" manufactured by Wilson Nafis & Co., Wharf street, Brisbane, and sold at 12s. 6d. can be recommended.

These instruments are suspended in the centre of the barn as nearly as possible level with the leaf of the bottom tier.

Humidification.

During the early part of the curing process it is necessary to have a humid atmosphere in the barn. Sometimes there will be enough moisture given off by the leaves to create a sufficiency, but not infrequently it will be necessary to add moisture to obtain the degree of humidity desired.

This is most easily effected by the introduction of steam from a boiler at low pressure—superheated steam is entirely unsatisfactory—either through a permanent pipe leading under one of the walls or by a hose through one of the bottom vents, to discharge in a tub or other receptacle, placed on the centre of the barn floor. The use of this tub is advisable to collect the water from condensation, so that the floor will not become saturated.

Another method is to start a small fire in the furnace and to place wet bags on the hot flues; these should be kept damp by the application of hot water, without however, unduly wetting the floor.

Should only a small addition of humidity be desired, it can be obtained by suspending wet bags over the flues.

The application of water to the floor is not recommended, especially if it is of earth. The reason for this is suggested in the fact that before proceeding to extract the moisture in the leaf during the fixation of colour all extra humidity must be expelled from the barn. When the floor is saturated this could not easily be accomplished, so that the ventilating air, introduced through the bottom ventilators, passing upward through the leaf would probably carry extra humidity, thus limiting its power of absorption of the moisture transpired therefrom and occasioning a liability to sponging.

Sponging, it may be noted, is a term descriptive of the darkening of colour induced when the moisture transpired from the leaf, not being immediately absorbed by the circulating air, collects upon its surface.

FLUE CURING.

In the production of bright tobacco there is no operation of greater importance than the curing of the leaf, for upon the success of this will depend in largest measure the monetary return that may be expected from the crop.

The process demands the greatest care and attention to all details, for good leaf can be completely spoilt by neglect, while leaf of apparently poor quality can be much improved in value by skilful treatment.

In order to secure the best result, it is imperative that the leaf should be of uniform body and texture, picked at the proper stage of ripeness, properly handled, and cured in a correct manner.

Leaf to an extent under-ripe can often be cured to a colour that would be classed as bright, though lacking in clearness; but proportionately as the leaf is under-ripe so will the flavour and smoking quality, as well as the brightness in the cured article, be depreciated.

Leaf that is grossly under-ripe cannot be cured a bright colour, and when saleable realises the lowest price of all grades.

Leaf that is over-ripe, in the sense that it has been allowed to remain on the plant beyond the desired stage of ripeness at which it should be picked, also, will not allow of a satisfactory cure. Depending on the degree of over-ripeness, it will cure an uneven colour with parts brittle and inelastic, or portion, or the whole, may perish before the colour can be fixed and the leaf dried out.

Leaves varying in body or thickness even when the degree of ripeness is uniform do not permit of being evenly cured together. As will be noted when the process is explained a thin leaf will cure more rapidly than one of greater body, so that if the stages are regulated for one depreciation will be suffered by the other, while if a middle course is pursued both will be lowered in value.

The flue-curing of tobacco leaf must not be regarded merely as a more or less rapid abstraction of the moisture therefrom, by the application of heated air; but rather as a process under which those leaf constituents that establish excellence in the cured product are further elaborated, during a prolongation of the life process, and brought to perfection as the leaf is killed by the gradual abstraction of moisture, so that they may be preserved in an unimpaired condition when the leaf is dried right out.

The process is the most modern and scientific method of curing tobacco, and it is due to the excellence of the quality thus obtained that the demand for bright tobacco, so cured, now greatly exceeds that for leaf cured by all other methods.

Descriptively the process is usually divided into three stages, viz.:—

(1) Yellowing the leaf;
(2) Fixing the colour and killing the leaf;
(3) Drying the leaf right out.

The yellowing stage might aptly be termed an acceleration of the ripening process, while the leaf is kept alive under particularly favourable atmospheric conditions, artificially obtained.

These are gradually modified in the second stage to allow of full ripeness, indicated by a more or less uniform yellow colour, being secured over the leaf, just as it is killed by the drying of the last of the moisture from the blade. The final stage is the simple evaporation by increased heat of the moisture remaining in the stem and mid rib.

As the change to a yellowish colour is regarded as an indication of ripeness in the field, so is the evenness and brightness of the yellow colour established in the cured leaf considered an index to quality, when the product is classified into various grades.

The colour most sought is the light bright yellow of a freshly ripened lemon, as leaf of this colour is in greatest demand and realises the highest price. Departure from evenness, clearness, and brightness in this particular colour induces a corresponding reduction in market value.

It is not possible to secure such a colour in all leaf, as climate and particularly the soil on which the crop is grown exercise an influence.

Much rain when the leaf is approaching ripeness will cause a delay in that direction by creating a further rise of sap, which is also apt to cause some regrowth, through which a cloudy or uneven colour with possibly some spotting will result in the cured leaf. Cold weather, also, will cause a delay in ripening that is prejudicial to colour.

The class of soil, however, on which the crop is grown will exercise the greatest influence in determining the colour possible of attainment in the cured article. Those light in texture where the percentage of sand is high and that of clay very low will produce leaf that is much easier to cure a good colour than those of heavier nature.

In proportion as the clay and fine silt content increases in the soil so will the body of the leaf be augmented and the opportunity of securing the brightest colour lessened.

Yellowing.

In the yellowing of leaf under cure it must be recognised that the change of colour will continue while there is life or moisture in the leaf; also that the yellow colour when obtained will turn to brown and later to black if the moisture is not abstracted in the correct manner to kill the leaf and thereby fix the colour at the proper time.

Colouring will progress most rapidly in a warm and humid atmosphere, such as would be indicated by hygrometer readings between 80 and 95 degrees dry bulb with a corresponding depression of from two to four degrees wet bulb while the leaf is fresh and crisp. Yellowing will continue up to 125 degrees provided there is life in the leaf, but will become slower as temperatures are increased and humidity is reduced.

In the early stages of the cure a low temperature is essential until the leaf has yellowed; a high temperature at this stage would ruin the tobacco.

The degree of heat to use at the beginning will be indicated to a certain extent by the average maximum temperatures that operated during the ripening of the leaf; it should be higher, but not in excess of 10 degrees. In most parts of the State a temperature of 90 degrees would be considered most suitable, but on the highlands of the South, where the days are much cooler, it might be better to start at a lower temperature and increase gradually over several hours to that degree. On the other hand in certain of the tropical districts where the days are likely to be hot a temperature of 95 degrees might be indicated. The barn being filled and the hygrometer suspended as indicated, the readings of the wet and dry bulbs are noted, and the door and all ventilators tightly closed.

A small slow-burning fire is now started in the firebox in order to raise the temperature in the barn slowly to that required, so that the heat may be gradually absorbed by the leaf. The time occupied in securing the desired temperature will be regulated to some extent by the number of degrees indicated by the readings when the barn was closed, but usually not less than two hours should be employed.

The humidity recorded by the difference in readings of the wet and dry bulb of the hygrometer should now be observed. Ordinarily during this period the leaf will transpire enough moisture to render the atmosphere sufficiently humid, but if the readings differ by more than three or four degrees, moisture should be added, as advised under the heading "humidification".

The desired atmospheric conditions being obtained in the barn, the fire can now be drawn and the damper in the stack, and door and cover of firebox and ashpit closed. If the barn has been properly constructed it will not lose any appreciable heat or humidity, and can be left untended for six or seven hours during which a drop of three or four degrees will not matter.

The leaf should be allowed to remain in this atmosphere until a distinct yellowing of the tips and edges of the leaves is noticeable, or as is often the case with very thin leaf until it has turned a pea-green colour.

Depending on the degree of ripeness and the amount of body in the leaf, this will take from twelve to thirty-six hours or longer. The temperature being at 90 degrees dry bulb and 87 degrees wet bulb is now raised gradually in the course of about two hours to 95 degrees, and so maintained until the yellow spreads towards the midrib or the pea-green colour becomes more evident. The temperature is then advanced during about two hours to 100 degrees and held there until the yellow colour is pronounced.

Ventilation.

Up to this point, the high degree of humidity indicated at the start should have been maintained in the barn to prevent any evaporation of moisture from the leaf taking place, by the introduction of more steam or by placing wet bags again on the flues, whenever the difference between the wet and dry bulb readings was in excess of 4 degrees.

When the leaf is placed in the barn it contains about 80 per cent. of moisture, which has to be abstracted during the curing process. The amount in each leaf will vary according to its thickness or body, thus indicating a longer or shorter period over which the colouring should proceed and evaporation of moisture take place. As colour changes while there is moisture in the leaf, and more rapidly when a high degree of atmospheric humidity prevails, it is evident that these forcing conditions must not be allowed to operate beyond a certain stage, otherwise establishment of the desired colour would be jeopardized through inability to dry out the blade of the leaf in time.

The art in curing is to abstract the moisture from the leaf after the yellowing has reached a certain stage, proportionately with the progress of further colouring so that the desired degree of yellowness will be secured just as the last of the moisture is dried from the blade of the leaf, thus killing it and fixing the colour coincidently. The importance of filling the barn with leaf of similar character as suggested under "Harvesting" is thus emphasised.

While a high degree of atmospheric humidity is maintained in the barn no evaporation can take place, consequently this humidity must be lowered before reduction of moisture in the leaf is possible. It is here that the use of the hygrometer is of great value, as it will indicate the degree of humidity, so that transpiration of moisture from the leaf can be regulated by judicious use of the ventilators.

The top ventilators are now opened about 1 inch and the heat increased gradually over two hours to 105 degrees, where it is held until the difference in readings of the hygrometer is approximately 8 degrees. When this difference is obtained transpiration of moisture from the leaf will be taking place and the fixation of colour will shortly be entered upon. The evaporation of moisture from the leaf takes place most rapidly in a dry atmosphere and is accelerated by increase of temperature.

It should make equal progress with the advance of the balance of colour sought. A decided advantage in this connection will be found when the heating flues are arranged to give an equal distribution of heat over the base of the barn and the bottom ventilators so constructed that the entering air would immediately come in contact with their hot surface. Under such an arrangement the air would be quickly and evenly heated and dried, so that in its upward passage it would draw and absorb the moisture in uniform measure from each of the suspended leaves and carry it out of the barn through the vents on top.

Control of evaporation is thus suggested in regulating the admission of the air through the bottom vents and its passage out of the barn through the vents on top, as well as by the degree to which it is heated. If the air outside the barn is very dry, as when a westerly wind prevails, the drying of the leaf can be effected at a lower temperature, while the circulation of the air should be lessened by reducing the openings of the top ventilators almost to a minimum to prevent the leaf from drying out too quickly. Should, however, the weather be wet the bottom ventilation should be reduced, more heat applied, and the top ventilation increased, in order that the most atmosphere should be driven out of the barn. When a satisfactory evaporation of moisture from the leaf can be effected at a low temperature the establishment of the desired colour is most easily effected. If, however, the circulating air is insufficiently dry and warm to absorb the moisture as it is transpired it will collect on the surface of the leaf and cause sponging or a change in colour to a reddish brown, which will materially reduce its value. The remedy when this occurs is to open the ventilators wide and rapidly increase the temperature by 10 degrees, or until the moisture has disappeared, and then reduce to what should be correct in each. On the other hand, if the heat is advanced too rapidly while there is much moisture in the leaf it will be killed too quickly, and a greenish red or black colour, which is even more objectionable, will develop.

The desired atmospheric conditions having been obtained at 105 degrees the ventilation is now increased by opening the top ventilators to a quarter of their capacity and the bottom ones sufficiently to cause the desired circulation of air. This will be dependent on the body of the leaf. Thin leaf will be about wholly lemon colour at this time and will need to be dried quickly, suggesting more bottom ventilation. Thick leaf on the other hand will need a somewhat longer time in order to secure additional colour.

The heat is now advanced gradually over about two hours to 110 degrees and not allowed to go above that temperature until the extreme tip of the leaf, on being touched with the finger, is found to be firm. This will indicate that not only has all excess moisture been expelled from the barn but that the leaf is commencing to dry, and fixation of the colour can be commenced.

The hygrometer should now show a difference of not less than 9 or 10 degrees between wet and dry bulbs.

Fixing Colour.

The top ventilators are now opened to half their capacity and the bottom ventilators to half or less, according to the thickness of the leaf; the heat is also advanced during about two hours to 115 degrees and held there until the ends of the leaves have shrunk and curled up. The difference in hygrometer readings at this time should be not less than 12 degrees. The instrument can now be removed and the large thermometer used during the remainder of the cure.

After this the top ventilators are fully opened and the bottom ventilators adjusted accordingly and the heat advanced over two hours to 120 degrees and held at that temperature until the edges of the leaf curl inward.

With full ventilation top and bottom the heat is now advanced over two hours to 125 degrees and held at that until the web of the leaf if dry except, perhaps, just near the midrib.

Keep ventilation at full top and bottom and then advance to 135 degrees in about four hours, and hold at that until the veins of the leaf are quite dry.

Drying Out.

After this is effected the moisture in stems and midrib must be extracted to complete the cure. The ventilation is now progessively decreased and the temperature increased by 5 degrees each hour until at 160 degrees the bottom ventilators are practically closed and those on top reduced to a mere crack.

The temperature is held at this point until the stems are all dry and will break without bending. This will be best determined by testing the leaf in top and bottom tiers at the corners of the barn, especially that nearest the door. The fire must now be drawn and the door and all vents opened wide to allow the barn and tobacco to cool down prior to conditioning the leaf for removal to the bulk shed.

It is not considered advisable to carry the heat beyond 160 degrees as higher temperatures will tend to reduce the elasticity of the leaf and dim the lustre of its colour. With heavy-bodied leaf, however, in which the brightest colour cannot be expected, higher temperatures might be employed but these should not exceed 175 degrees.

The period occupied during the cure will vary according to the body of the leaf, from three days with extra thin leaf to five days with medium-bodied leaf being usual. With heavy-bodied leaf, however, the cure will probably take six or even seven days.

Modifications.

No set formula can be suggested for curing tobacco, as the type of leaf and the climatic conditions prevailing during the process will necessitate a variation in the method of treatment.

The following modified directions, however, for curing leaf of different texture if followed should give a more or less satisfactory result.

EXTRA THIN LEAF.

Start at 90 degrees dry bulb 88 or 87 wet bulb, hold until the edging of the leaf shows a light yellowish or pea-green tint. Raise in two hours to 95 dry bulb and 92 or 91 wet bulb and hold until the yellow tinge has spread towards the midrib or the major part of the leaf has assumed a definite pea-green colour. Raise during two hours to 100 dry bulb and 96 or 95 wet bulb and hold until the yellow tint or light pea-green colour is shown all over the leaf or it is just short of lemon colour.

Now give one-fourth of the ventilation on top and bottom and increase the temperature during two hours to 105 degrees and hold until the tips of the leaf are firm. The leaf should now be practically a lemon colour. Then give half ventilation on top and one-fourth or more below and increase the temperature to 110 degrees. Hold at this until the ends of the leaf shrink and curl up. Now give full ventilation top and bottom and increase the heat over two hours to 115 degrees and hold until the edges of the leaf curl inward.

Then increase to 120 degrees over two hours with full ventilation and hold until the web of the leaf appears dry. Now advance at the rate of 2½ degrees per hour until 130 degrees and hold at that until the veins are all quite dry.

Now progressively decrease the ventilation and increase the temperature by 5 degrees per hour to 160, when the bottom vents should be closed and those on top reduced to the merest crack. Hold at 160 until the stems will break without bending.

The cure is now completed and the fire can be drawn and the door and all vents opened wide to allow the barn and tobacco to cool down.

MEDIUM-TEXTURED LEAF.

Start at 90 degrees dry bulb 88 or 87 wet bulb and hold until the tip and edges of the leaves become yellow. Advance in two hours to 95 degrees dry bulb with wet bulb 92 or 91 and hold until this colour spreads about half-way towards the midrib. Advance during two hours to 100 degrees dry bulb with wet bulb not lower than 96 and hold until the yellow colour is more pronounced. Now open top ventilators about an inch or two and advance temperatures in two hours to 105 and hold until the wet bulb registers 8 degrees below the dry bulb: if the colour increases too rapidly during this stage open the bottom vents a little. Now give one-fourth top ventilation and one-eighth or one-quarter bottom ventilation and increase the heat during two hours to 110 degrees. Wet bulb should now read 101 or 100 degrees. Hold at this until the extreme tip of the leaf is firm to the touch. Now give half ventilation top and bottom and increase the heat during two hours to 115 degrees, hold at this until the end of the leaf shrinks and curls up.

Now give full ventilation and advance the heat during two hours to 120 degrees and hold until the edges of the leaf curl inward. Advance to 125 degrees during two hours and hold until the web of the leaf is apparently dry. Now advance with full ventilation at 2 degrees per hour to 135 degrees and hold at that until the veins of the leaf are quite dry.

The ventilation is now progressively decreased and the temperature increased by 5 degrees each hour until 160 degrees, when the bottom vents should be closed and those on top show only a small crack. Hold at 160 degrees until the stems will break without bending, then draw the fire and open the door and all vents to allow the barn and tobacco to cool down.

HEAVY-TEXTURED LEAF.

Start at 90 degrees dry bulb and 88 or 87 wet bulb and hold until the tip and edges of the leaves assume a yellow colour and the balance of the leaf has turned a lighter green.

Advance to 95 degrees dry bulb and 92 wet bulb and hold until the yellow colour spreads towards the midrib. As there is a lot of moisture in heavy leaf, in the evaporation of which further colouring will be made, it is advisable at this stage to commence the reduction of the atmospheric humidity in the barn.

Open the top vents 1 or 2 inches and just crack the bottom ones and raise the heat during two hours to 100 degrees. Hold at this until the wet bulb is reduced to 95 degrees and the yellow colour has advanced over half the leaf. Now increase the top ventilation to one-third and the bottom ventilation to one-quarter and increase the temperature gradually at the rate of about 2 degrees per hour to 110 degrees, when the wet bulb reading should be 101 or 100. When this disparity obtains increase at the same rate with half ventilation to 115 degrees and hold until the tips of the leaves harden. Now advance at the rate of 2 degrees per hour to 120 with full ventilation and hold until the end of the leaf shrinks and curls up. Then advance at the same rate to 125 degrees and hold until the edges of the leaf curls inward.

Now advance to 130 degrees and hold until the web of the leaf is dry, when a further advance should be made to 135 and maintained until the veins of the leaf are quite dry.

During these periods careful watch should be kept on progress of colour and reduction of moisture in the leaf. If the colouring is too fast when the ventilation is limited increase the openings top and bottom and rise the heats a little quicker to accelerate the drying of the leaf.

On the other hand if the colouring is too slow reduce the bottom ventilation considerably and the top slightly to retard drying, but be careful in so doing not to induce sponging. When conditions at 135 degrees are satisfactory dry out the midrib and stem by raising the temperature 5 degrees an hour, decreasing the ventilation at the same time until at 160 degrees it is reduced to a minimum.

In some instances it will be advisable to extend the heats to 175 degrees, in which case reduction of ventilation will be more gradual.

Keep at the higher temperature until the stems will break without bending, then draw the fires and open the door and all vents to allow the barn and tobacco to cool down.

POINTERS FOR CURING.

In each barn full of tobacco, some slight variation in the curing may be expected.

Humidify the atmosphere and avoid saturating the floor as it will cause trouble later.

With late-grown leaf yellow at lower temperatures.

In cool weather use lower temperatures.

In wet weather start ventilation earlier and increase top ventilation.

When external atmosphere is very dry decrease top ventilation and regulate bottom ventilation to prevent too rapid drying.

Dry over-ripe leaf at a low temperature with full ventilation.

When the leaf is colouring too quickly increase ventilation, and then gradually increase the heat.

When leaf is drying too quickly reduce or close bottom ventilators and lessen top ventilation.

Increase ventilation with increase of temperature when fixing colour.

Do not decrease ventilation with a view to raising temperature except when drying out between 135 and 160 degrees.

A fire with little blaze permits a steadier heat.

A blazing fire increases the heat rapidly—use the damper when adding more fuel.

Use the peep-hole when reading the hygrometer or thermometer.

Open the door only when unavoidable or when necessary to inspect the leaf.

Do not take a naked light into the barn when tobacco is drying—use an electric torch.

Examine leaf through top ventilators as well as by the door.

Colour in daylight is more apparent than under artificial light.

A slight greenish tinge in the cured leaf will disappear in bulking.

LOG BOOK.

A log book, of which the following is suggested as a heading for each page, should be kept at the barn and the particulars of each cure entered therein.

NAME OF FARM.

Number of Barn.	Number of Cure.	Number of Sticks.

Weather conditions during growth: ....

Weather conditions at harvest: ....

Kind and condition of leaf: ....

Date.	Temperature. Time.	Dry.	Wet.	Remarks on colour and condition of leaf, ventilation, &c.

The observations thus recorded will be a guide in further cures when modifications where indicated would ensure a better result.

CONDITIONING.

When the cure has been completed and the barn cooled down the leaf will be exceedingly dry, and so brittle that it cannot be handled without liability to damage until it has absorbed sufficient moisture from the atmosphere to render the blade of the leaf pliable. Usually when the door and ventilators are left open during the whole or part of a night the tobacco will have come into condition for handling by the morning. When, however, the weather is particularly dry, and the atmosphere at night is insufficiently humid, artificial means will need to be adopted.

In this case the barn must be tightly closed and the atmosphere within humidified by the introduction of steam at a very low pressure, damping the walls, or by laying wet bags upon the floor and the flues, as was suggested at the beginning of the cure.

Care should be taken when conditioning to see that the leaves do not absorb too much moisture. Those on the sticks of the lower tier will come into condition first and should be removed from the barn as soon as they are ready.

Where tobacco is to be grown on an extended scale conditioning will be facilitated by the provision of a conditioning room in which the atmospheric humidity can be regulated by mechanical means, or by the excavation of a cellar in which the sticks of leaf could be suspended as in the barn and brought into condition without delaying the use of that structure. In this connection the leaf would first of all be rendered sufficiently limp by the introduction of steam from a boiler at low pressure to allow of transference from the barn. It may be noted that the leaf rendered limp by hot steam will become less pliable as it cools down.

The correct condition for transference to the bulk shed for bulking down is when the web of the leaf and a half of the midrib back from the tip are pliable and the remainder of the midrib is slightly supple but will break before bending to a right angle. On removal to the bulk shed the sticks of leaf should be carefully stacked; in forming this the floor is first covered with bags, matting, or such like, to keep the tobacco clean; the sticks are then laid carefully thereon so that the leaves lie evenly, those on the second stick overlying those on the first except for a fw inches back from the stick, and so on to the length desired. The stack is then built up by layers of sticks commencing from each end alternately.

If not convenient to detach the leaf from the stick immediately the stack should be covered with a tarpaulin or bags for a few hours, during which the tobacco will tend to even in condition.

BULKING.

When proceeding to bulk the leaf, which should be effected as soon as possible after conditioning, the sticks are taken a few at a time into the grading shed, which is well lighted, and the leaves detached. Opportunity at this time should be taken to roughly grade the leaf into, say, four grades, of which the preponderating colours would be bright, medium, dark, and green.

Each of these grades should then be bulked separately in the bulk shed, the brightest being built in the most accessible position, as it will be finally graded and packed first, and the green in the least convenient part, as it will require to be left longer in the bulk for the colour to improve and will be finally graded and packed last of all.

The bright leaf should be bulked in as dry a condition as will allow of handling without breakage, while that of green colour will be benefited with a little more condition but with insufficient moisture to induce moulding.

When untying the leaves from the sticks careful watch should be kept for any in which the midrib has not been properly dried out during the cure. These soft or "fat" stems contain much moisture and would induce mould if included in the bulks. They should be put on one side, restrung and suspended in a dry place until the temperature in the next barn of leaf under cure is about 140 degrees, when they should be placed therein and dried out.

The bulks should be built in a floor at least 1 foot above the ground level, either of straight poles or boards with a space of not more than 1 inch between. When the surface of the flooring is rough or uneven it is advisable to cover it with bags or hessian before forming the bulk.

The bulks can be built to any convenient length and should be at least 4 feet high and 4 to 6 feet wide. When placed in very small bulks the tobacco has less chance of improving in quality, as the leaf tends to dry out too quickly.

When constructing the bulk it is advisable to lay the leaves with butts outward to form the edges of the sides and ends, slightly rounding the corners; the leaves

should not be bent so that the tip points in any direction except directly away from the butt, nor should they be flattened out; they should be bulked just as they are taken off the stick. The next lot of leaves should be laid in similar fashion but with the butts about 4 inches back from those first laid and this procedure followed as far as possible to the centre, where it is not material in which direction the butts face. Successive layers are thus added to build to the height desired.

When the grower, however, is not thoroughly experienced in the conditioning of leaf it will be advisable to construct the bulks by laying two rows of leaves to any convenient length, butts outward and with tails overlapping about one-third of their length, and as high as practicable.

When the bulks are completed, planks are placed on top and weighted to press the tobacco down. The whole can then be covered with a tarpaulin, blankets, or other suitable material to exclude strong light and protect the tobacco from atmospheric changes.

In a properly constructed bulk shed the temperature and humidity will not show much variation. Should, however, the atmosphere become very dry water can be added to the ground below the floor to prevent the leaf from drying out. A hygrometer will be found of much value in the bulk shed.

The bulks should be inspected daily for the first week and regularly thereafter to detect any heat or fermentation that would ensue if the leaf contained too much moisture. Should any rise of temperature occur the bulk must be broken down and rebuilt after the leaf has been shaken out and aired, placing that from the centre to form the sides and that from the bottom to form the top of the new bulk.

The close contact of the leaf in the bulks when in proper condition induces certain changes in the leaf which improve the texture and develop aroma, while much of the green tinge will disappear and the colour generally be evened up and brightened.

It is considered advisable to hold the tobacco in the bulks for five or six weeks before assorting the leaf into its different classes and packing for despatch to market.

GRADING.

In order to secure the best price for his product it will be necessary for the tobacco-grower to have particular attention paid to the assortment of his leaf into distinct classes or grades.

Properly graded leaf in which the colour, texture, quality, and size of leaves are uniform provides an attraction to the buyer that invariably results in a more profitable return than would be the case if colours were mixed, texture and quality varied, or the lengths too uneven.

In a systematic classification of leaf it would first be divided into types suggestive of body or thickness of leaf, and the manner of its use or manufacture, such as wrappers, fillers, cutters, and lugs. These would be divided into colours as lemon orange, bright mahogany, mahogany, dark, and green, and then further separated into a number of qualities covering texture, elasticity, oil venation, finish, &c., as well as extent of damage.

Before, however, such a classification could be fully effective it would be necessary to have a standard of grades adopted that would be satisfactory to manufacturers, so that the leaf could be sold under competition by public auction or otherwise.

It is not to be supposed that the grower will be able without considerable experience to grade his leaf into definite classes; this would be most advantageously accomplished in a grading warehouse where a trained staff would be engaged. He will, however, find it profitable to grade as far as possible on the farm, as this will not only lessen the cost of further grading but improve his knowledge of leaf quality, and thus suggest directions in which improvement could be effected.

A well-lighted room is absolutely necessary to permit of satisfactory grading, as well as a good sense of colour on the part of the assorter.

When a preliminary rough grading to colour was made before the leaf was bulked down further grading will be facilitated.

The benefit also of an even stand of plants will be appreciated when assorting if the bulks from each cure are kept separate, as the leaves will have been picked from the same positions on the respective plants and consequently be of much the some texture.

The bulks of brightest leaf should be graded first, and that of greenish tinge last, as a longer period in the bulk will allow an improvement in colour.

Until a more satisfactory system of grading is made possible, the following simple descriptions will allow the grower to classify his leaf to advantage.

The leaf in each grade should be separated into lengths permitting a range of 5 inches in each.

The following descriptions are suggested for the leaf in each grade:—

Lemon 1 (L. 1).—Clear lemon to light orange, free from damage by disease, insect pests, or bad handling. Leaf with a greenish-yellow tinge may be included in this grade.

Lemon 2 (L. 2).—Clear lemon to light orange, slightly perished from being over-ripe, slightly damaged by disease, insect pests, or bad handling. Leaf with a yellowish-green tinge may be included in this grade.

Lemon 3 (L. 3).—Lemon to light orange in colour that would not be placed in the previous grades.

Lemon Scrap (L.S.).—Leaf of clear lemon colour that is broken, torn, or undersized. This leaf would not be put into hands.

Bright Mahogany 1 (B.M. 1).—Orange to light red, clean and free from damage. Leaf with a greenish-yellow tinge may be included.

Bright Mahogany 2 (B.M. 2).—Orange to light red, slightly perished from being over-ripe, or lightly damaged from disease, insect pests, or bad handling.

Bright Mahogany 3 (B.M. 3).—Orange to light red, sponged, or showing more damage than B.M. 2.

Mahogany 1 (M. 1).—Red to reddish-brown, clean, sound leaf, but may be somewhat sponged or show a slight greenish cast.

Mahogany 2 (M. 2).—Same as M. 1, but slightly perished from being over-ripe, or slightly damaged from insect pests, disease, or bad handling.

Mahogany 3 (M. 3).—Same in colour as M. 1, but would not be placed in the previous grades.

Dark 1 (D. 1).—Dark red to dark brown with parts of lighter colour; clean whole leaf. Leaf with a slight greenish tinge may be included.

Dark 2 (D. 2).—Similar to D. 1, but slightly perished from being over-ripe, or lightly damaged from disease, insect pests, or bad handling.

Dark 3 (D. 3).—Inferior to D. 2, or dark brown to black.

Green (G.).—All leaf having a pronounced greenish colour.

Inferior Bright (I.B.).—All leaf of generally bright colour that cannot be classed in the bright grades mentioned. Need not necessarily be put into hands.

HANDLING.

After the leaf has been sorted into the different grades it is tied into hands, each containing from twelve to twenty leaves according to their size. It is not necessary to count the leaves to form a hand, but a sufficient number should be used to make the butt measure as near as possible 1 inch in diameter; if made too big the hands are less presentable and liable to become loose.

Medium-sized leaves of the same grade, made extra limp by steaming or other suitable means, are used to bind the hands. Each such leaf is folded so that the midrib will be on the inside and not show when the hand is tied. Grasping the bunch of leaves in the left hand, the butts are beaten or pressed down until they are level. The binder is then held with the tip pressed firmly against the stems about 1½ inch from the ends by the left thumb and wound tightly round with the edge about ¼ inch above the butts until about 4 inches remains. The leaves of the hand are now evenly divided and the butt end of the binder pulled through to keep it from becoming unwound. A neater tie is made when the binder is made to cover the ends of the butts before being wound around, but this is not essential. The binder should not reach too far down the hand, a width of 1½ inch to not more than 2 inches with large leaf from the butt end being desirable.

A neatly tied hand renders the tobacco more attractive.

After being tied into hands the tobacco can be built into bulks, following the same procedure as with loose leaf, until packing for market is desired.

PACKING.

Where sawn timber is to be obtained at a reasonable price the packing of tobacco in boxes is recommended for transport to market, as it will not only carry in better condition but will be less subject to damage from rough handling than if packed in bales.

A suitably sized case of ¾-inch boards of suitable timber such as pine, 48 inches long by 30 inches wide and 30 inches deep external measurements, is suggested as a standard. This sized case can be expected to hold up to 430 lb. of the brightest leaf and somewhat more of lower grades.

Where it is desired to pack the tobacco in bales a standard size is suggested as 34 inches long by 24 inches wide by 16 inches deep. This sized bale should weigh from 160 lb. to 200 lb., according to the quality of the leaf.

Whether packed in cases or in bales, it will be necessary to have a method of applying considerable pressure in the process of packing.

When a standard size for case and bale has been adopted, specially manufactured presses will doubtless be purchasable. Suitable home-made presses, however, can be constructed for boxes or bales, the pressure being applied as in a wine or wool press, or by a lever as in an old type of cheese press.

Where cases are to be used it would be necessary to have a frame to hold the case during packing. A box frame of the same length and width of the case would also be necessary to fit on top of the packing case to allow of the requisite quantity being pressed therein.

Where the tobacco is to be packed in bales a stout baling box with hinged sides and ends is suggested of the length and breadth of the bale but of double the depth. A loose bottom would be provided as well as a loose top, so that when the requisite quantity of tobacco had been pressed to the desired depth the sides of the press would be allowed to fall back and four steel rods with each end turned a few inches at right angles in the same direction slipped over the edges of the top and bottom, so that the tobacco would not spring when the pressure was released. To avoid delay this lot could then be taken from the baling press and set on one side for several hours to allow the leaf to bind, so that the covering could be sewn without trouble.

Particular attention should be paid to the condition of the leaf when it is being packed, as too much moisture will cause a darkening of the leaf, if not the formation of mould, while too little will cause a breakage of leaf.

The correct moisture content is from 12 to 14 per cent., which is denoted when the blade and tip of the leaf are pliable but not soft and the midrib slightly pliable but breakable before bending to a right angle over the greater part of its length.

If the leaf is too moist or too dry it will need reconditioning. This can be effected by dividing the leaf of the hands at right angles to where they were parted to receive the end of the tie and placing them astride tobacco sticks, or they can be tied on with string in the same manner as with green leaf and placed in the barn or conditioning room to be properly ordered.

In packing the hands into the cases or baling-box a layer is placed at each end with tails pointing towards the centre of the case, then another layer is placed in a similar manner but 6 inches back from the first and continued until the tips of the last layer overlap the previous one by more than half its length; if it is short of this, one layer is placed across the centre of the case.

This procedure is followed with the next layer, but starting at the sides so that the hands will form a bond, and so on alternately until the case is filled. Where an odd layer is required in the centre the butts should be placed to point in the opposite direction in alternate layers.

As each layer is placed in position it should be pressed down with one or two smooth boards 12 inches wide, respectively an inch shorter than the width and length of the case. Care should be exercised in placing either of these boards on the leaf and in pressing upon them so that no stems are broken. When the requisite quantity of leaf has been packed the high pressure is gradually applied and the tobacco compressed to the desired extent.

As each case or bale is completed the distinguishing grade mark should be neatly stencilled thereon, together with the weight of leaf enclosed.

MARKETING.

Farm Selling.

At the present time it would appear that the only manner in which a grower can dispose of his leaf is to make a sale on the farm to a visiting representative of a manufacturer, who, after inspecting the tobacco in bulk, makes an offer of a price for each grade or an average price for the crop, the leaf to be packed and delivered in good condition by the grower either free on rails or at the tobacco factory.

This manner of sale is unsatisfactory to both grower and manufacturer. Even with a reasonably good classification the buyer's offer will be on the conservative side to allow for the possibility of a percentage of the bulk proving inferior, while in the absence of open competition the best price cannot be realised. The grower also is at another disadvantage in that he is responsible for the delivery of his tobacco in good condition at the buyer's factory after it has been transported probably upwards of 1,000 miles.

In the manufacture of high-grade smoking mixtures either for pipe or cigarettes the standard of excellence is maintained by adherence to a particular formula under which certain grades of leaf are blended in definite proportion. Manufacturers consequently who only require particular grades are thus forced to buy a proportion of leaf they cannot use.

Organisation of Growers.

Viewing the probability of a rapid extension in the production of bright tobacco in the State, especially in northern parts, where the quality of leaf produced has earned the commendation of both manufacturers and consumers, the early formation of a tobacco-growers association is indicated, through which the interests of the producers can not only be protected but advanced in many directions.

The benefits received by sugar-cane growers through their associations could, it is thought, be experienced in perhaps fuller measure by tobacco-growers if organised under somewhat similar lines.

Immediate attention is desirable towards the institution of a better system of marketing tobacco leaf, through which the grower will be able to obtain the true market value of his product. Sales by auction or other competitive means are indicated.

Standard Grades.

Before sales of tobacco by auction or otherwise could be most satisfactorily effected it would be necessary to have standard grades adopted throughout the State so that buyers at a tobacco auction could make their bids with as much confidence in the description of each such grade as the wool buyers have in those of the catalogues at the various wool sales.

Grading Centres.

As the accurate classification of leaf into standard grades would not be possible on all farms, the establishment of conveniences for grading, conditioning, and packing, preferably on co-operative lines, is indicated at various convenient centres.

Research.

With a comparatively new industry the necessity for experiments to determine the suitability of varieties, fertilizer mixtures and their application, cultural methods, &c., &c., for each district is apparent. In this direction results will be more easily and rapidly secured when there is collaboration between growers through their organisation with the Department of Agriculture.

Stabilising Prices.

Notwithstanding the fact that a high degree of protection is afforded the Australian tobacco-grower through the Customs tariff, the possibility of an understanding being arrived at between manufacturers to fix the price of leaf must be taken into consideration.

Tobacco properly conditioned and packed will keep for a number of years. With an effective organisation the growers can counter any move to fix lower prices than they are agreeable to accept by withholding supplies or engaging in manufacture themselves.

FLUE CURING BARNS.

By N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

DURING the years since the process of flue curing tobacco leaf was evolved it will readily be understood that various types and sizes of buildings have been used for the purpose and that experience so gained, coupled with an appreciation of the principles involved in the promotion of a satisfactory cure, would suggest a particular structural form embodying certain essential features as being most desirable.

Control of temperature and atmospheric humidity within the barn is a sine qua non in successful flue curing.

The process, which will be more particularly set out under flue curing, demands the retention of a high degree of humidity at regulated temperatures in the early stages of the cure, when it is desirable that the barn should be air tight.

In later stages, as temperatures are progressively increased, this humidity is gradually lessened by the use of the ventilators, and finally the cure is completed and the leaf dried by the circulation of further air, introduced through the bottom ventilators, where it comes in immediate contact with the hot flues and is dried and heated to particular temperatures. It then rises, passing between and around the suspended leaves, from which it absorbs the moisture transpired and is discharged through the ventilators on top.

It is important, therefore, that the barn should be provided with adjustable top and bottom ventilators of suitable capacity, and that it should be practically air-tight when these are closed. Should the barn not be airtight, or the ventilation not be capable of being increased or decreased as required, adequate control would not be possible.

The walls and roof of the barn should be of sufficient thickness or so insulated as to disallow undue escape of heat and to prevent the atmosphere within the building from being affected by external conditions.

An even application of heat is most desirable, in which connection it is found that the heating flues can be arranged to the best advantage when the base of the barn is square rather than oblong and the desired capacity of the structure obtained by the provision of comparatively high walls with a restricted ground area rather than otherwise. Under this arrangement the air admitted to the barn is not only more evenly and quickly heated, but its circulation upward, owing to the narrowed column, is more easily accelerated or retarded by means of the ventilators and control thus facilitated.

A variety of materials can be used in barn construction, choice being influenced by cost, effectiveness, and durability. A point of great importance is the proofing, as far as possible, of all woodwork against white-ant attack.

Walls.

For the walls reinforced concrete, hollow concrete blocks, and brick are naturally suggested as the most durable; but equally effective structures can be made of pisé de terre, logs, slabs, or a wooden frame sheeted wholly with iron, wood and iron, or with a non-inflammable composition such as asbestos cement.

Logs.

Where straight logs can be easily procured, quite effective walls for the barn can be constructed. Each log should be trimmed where necessary and halved or grooved at the ends where the logs of the other walls, similarly treated, would join to form the corners. Butt ends should alternate with small ends so that the top of the wall will be level when completed. All interstices throughout are filled with puddled clay, or mortar made of sand with lime or cement, in order to render the building as airtight as possible.

The wall at the firebox end is preferably built up with stone and mortar for about 2 feet above the top of the firebox or a total height of 5 feet, a further advantage being gained where the first 2 feet of the other walls are similarly constructed.

Where the nature of the ground will permit, the base could be excavated within a foot of each wall up to 5 feet in depth, thereby saving the building of that amount of wall and considerably lessening the danger from fire.

The possibility to damage from white ants should be carefully considered as well as the liability of the bottom logs to decay; these should be of the most durable timber, deprived of all sapwood and kept well poisoned.

Slabs.

Sawn or split slabs with dressed edges can be used, laid horizontally between posts the requisite distances apart, being held in position either by a groove cut vertically the full height of the post or by cleats nailed or bolted thereto.

The slabs can be laid double so that the joins on one side are covered by the slabs on the other, or single slabs of 2 or more inches in thickness can be laid and the joins covered with strips of iron or board inside and out. All interstices should be filled with clay or other material as with log walls.

As the posts of this structure will be of necessity sunk in the ground, any excavation could hardly go deeper than 2 feet, to allow the posts to be sunk to a sufficient depth below to ensure stability in the structure.

As with the log walls, precautions should be taken against the decay of the timber and damage from white ants.

Pise.

Walls of pisé will be found very effective, and when well constructed most durable, especially if the roof is made to project and the part exposed to the weather plastered with a cement compo.

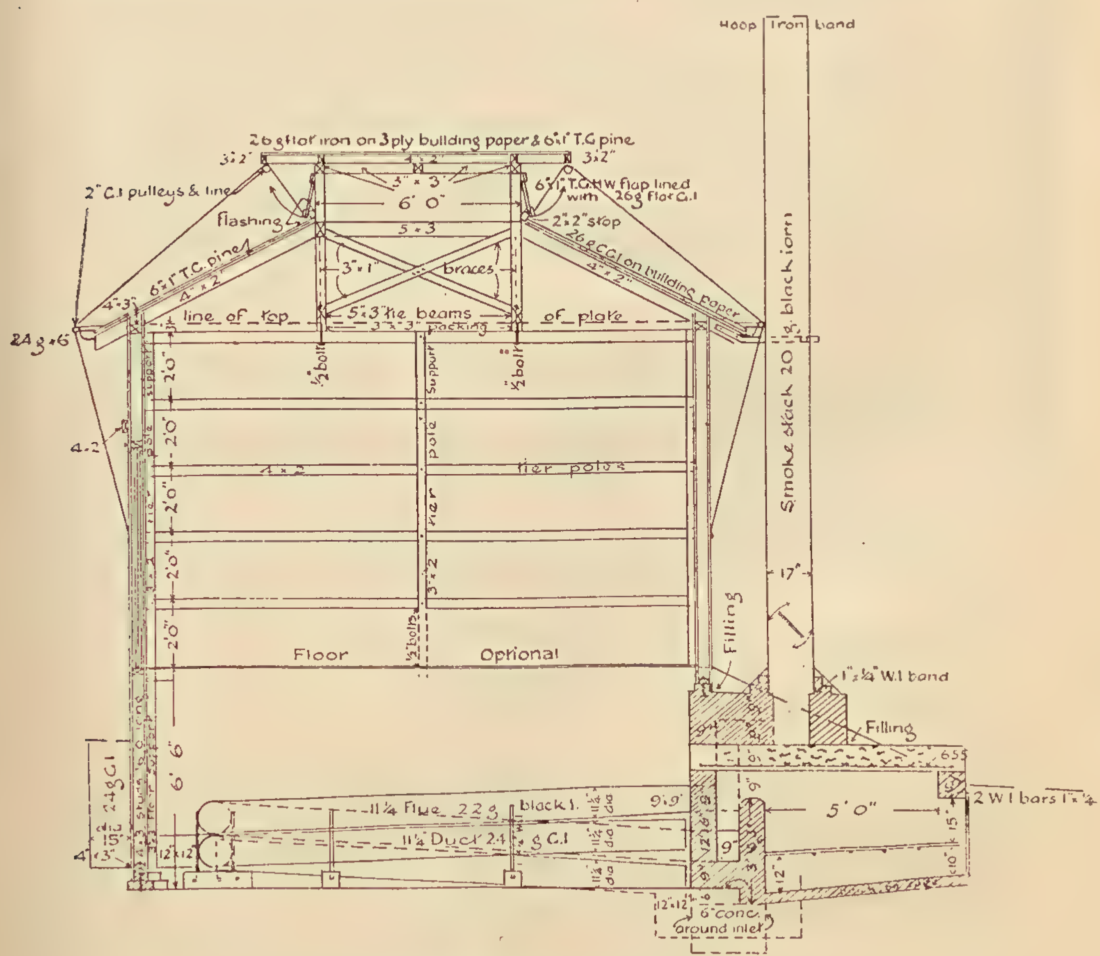


Plate 10.—Flue Curing Barn (Section).

Pisé is a term applied to stiff earth or clay when used to form walls by being rammed into moulds as they are carried up. These moulds or boxes should be of convenient size and made of a timber that will not warp or shrink, lightness in weight being an advantage when handling. Twelve by 1½ inch boards are suitable, while a convenient depth of mould is 2 feet.

Wood and Iron, &c.

The type of wall that will probably find most favour will be that constructed of a framework of sawn or dressed hardwood sheeted with iron inside and out, and the space between filled with perfectly dry sand or soil. The studs, preferably 4 x 2 with ground plates of 4 x 3 or 4 x 4 and wall plates of 4 x 2, should be at intervals of 2 feet centre to centre when corrugated iron is used and 18 inches centre to centre where the sheeting of flat iron is used. Corrugated galvanised iron of 26 gauge should be used on the outside, the sheets being laid horizontally, while the same material or flat galvanised iron can be used on the inside; the corrugated article makes a stronger job. On the outside the top sheet should lap over the bottom sheet to keep rain water from entering, while on the inside it is preferable to reverse this proceeding and make the sheet below lap over the one immediately above so that the fine parts of the filling will not escape. The framework should be erected and properly braced at each corner and the wall plates temporarily fixed. The inside sheeting is now completed, after which the bottom sheets on the outside are nailed to the studs and the space filled with the dry earth or sand with each successive sheet, the top plate being removed as the last sheet is put on to allow of the filling being completed.

It is advisable that the sand or soil should be perfectly dry and finely broken so that it will fill the corrugations of the iron and no spaces will form after the job is completed. Other material can, of course, be used for the filling, but it is not likely to be cheaper or more readily obtained. White ants are guarded against by laying the ground plate on strips of flat galvanised iron 9 inches wide, preferably soldered together, well tarred and sanded, while they could also be well poisoned.

Another type of framed wall has been used where a sheeting of T. and G. boards is nailed on the outside of the studs, covered with building paper, and further sheeted with corrugated iron. The T. and G. sheeting would in most places, however, be more costly than iron. Asbestos cement sheets are suggested for sheeting and may prove quite satisfactory, but are likely to be more expensive when landed on the barn site than iron, as, owing to their greater weight, the cost of transport will be much heavier.

Roof.

The framework for the roof should be of sawn timber to make the best job, though straight bush poles are possible of use. A sheeting of tongued and grooved flooring boards should be laid on top of the rafters, over which galvanised corrugated iron or other equally durable waterproof material is placed. The boards should be thoroughly seasoned, as if not they are liable to shrink apart during the process of curing and thus allow escape of air and heat. If the roof is gabled, the walls at each end should be similarly treated.

An improvement will be found when a lining of building paper, ruberoid, or similar material is placed between the boards and covering iron. It is important that the roof should sit snugly on the wall plates so that leakages of air will not occur.

Shaped packing pieces should be fitted between the rafters to fill the space between the top of the wall plate and the T. and G. sheeting.

Good insulation in the roof as well as in the walls tends to economy in fuel consumption.

Furnaces.

Suitable material for the construction of the furnace or firebox will be found in bricks, cement concrete, or pisé, preferably made from good antbed, while in cases where excavations for the purpose are made, the natural walls so obtained can occasionally be used. The top should be formed with an arch of brick set with antbed mortar, a slab of reinforced concrete at least 9 inches thick, or boiler plate covered with a thick coating of clay and sand.

Where cement concrete is used the aggregate should be fire-resistant and broken to pass through a 1-inch mesh. Igneous rocks such as quartz, basalt granite, &c., should be selected, as sedimentary rocks are generally unsuitable.

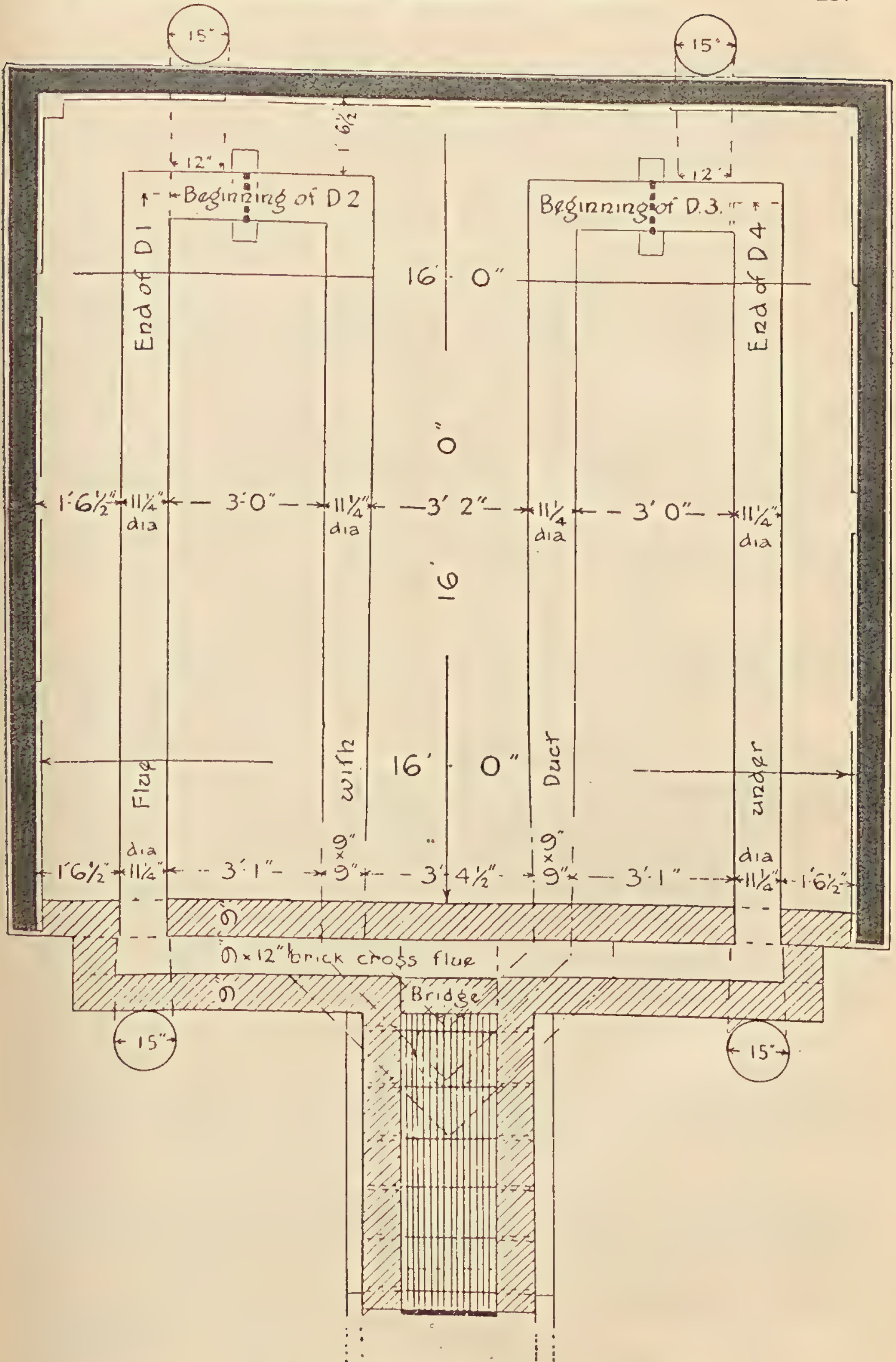


Plate 41.—Flue Curing Barn (Ground Plan).

The firebox should be of good capacity, a width of 2 feet, height of 2 feet, and length of 6 or 7 feet, interior measurements, being satisfactory. Where firebars are used, an ashpit 15 to 18 inches in depth must be added and the firebox fitted with a door and cover over the ashpit to control the draught. Without firebars it is found the fire will burn steadily and allow, with a little experience, the heats to be satisfactorily regulated. The installation of firebars with a door to the furnace and cover over the ashpit, however, will facilitate control of the heat and result in some economy in fuel consumption.

Construction of the furnace at the side of the barn furthest from the direction of the prevailing wind will also be found helpful in regulating the fires.

Barns are sometimes provided with two furnaces with independent flues and separate chimneys, or they may discharge into a common chimney; but with the largest sized barn now advocated one, properly built, is regarded as sufficient.

With a view to economy in fuel, the firebox is sometimes built with the greater part of its length within the barn so that the heat radiated from its brickwork will not be lost. With a properly constructed furnace this radiation is of little moment in comparison with the greater difficulty presented in securing an even distribution of the heat within the barn.

It is considered the most satisfactory heating will be ensured by constructing, outside the barn, a single firebox with a flame bridge, behind which cross flues will carry the divided draught to the flues entering the barn. These cross flues can be of brick or of iron covered with a coating several inches thick of puddled antbed, so that, should the iron burn out, the encircling antbed will still provide a satisfactory flue.

Where the furnace walls and top and the encasing antbed of the cross flues are thick and further insulated by a covering of earth or sand little loss of heat should result.

Flues.

The object of the flue is to increase the temperature within the barn by a radiation from its surface of the heat passing through from the burning material in the firebox without allowing the escape of any gases or smoke within the building

Obviously the radiation of heat therefrom will be governed by the surface offered and the thickness of the material used in construction, this latter in turn being determined by its resistance to wear.

It is found that very satisfactory flues can be made from sheets of flat iron 3 feet wide and 3 feet 6 inches long of 22 or 24 gauge respectively, curved and the edges lapped and riveted, or turned, folded, and swaged into tubes of a little over 11 inches in diameter, one end being made slightly smaller than the other to allow of telescopic joins or of being riveted together.

The heavier gauge should be used from the firebox and for 3 feet after it passes through the wall, where provision should be made to allow of easy replacement when required. Gauges of 20 and 22 will naturally provide a longer service; but when provision is made for easy replacement at the furnace end and by telescopic joins it is suggested that the extra fuel consumption thereby entailed would render the lighter gauges more economical.

Arrangement of Flues.

The flues should enter the barn a little above the floor level and gradually rise throughout their length, so that the centre of the exit is 12 or 15 inches higher than that of the entrance. They should be so disposed that the radiation of heat therefrom will induce the temperature in each corner at every stage of the cure to be as nearly as possible the same as that in the centre of the barn.

The most satisfactory arrangement to approximate this is suggested in an equal division of the draught from the furnace into two flues which will enter the barn at that end, being centred one-eighth of the interior width of the building from the sides, along which they are carried to a similar distance from the next wall, to turn and continue at the same distance for one-fourth of its length, when they would turn and continue parallel, to emerge from the building and enter a common chimney above the firebox.

There would thus be four lines of flue across the barn, centred progressively from the walls they parallel one-eighth, one-quarter, one-quarter, one-quarter, and one-eighth of the interior width of the structure. Across the end opposite to the

furnace there would be two lengths of flue, together equal to half the width of the building. It is calculated that the increased radiating surface thus provided at this end would ensure a heat equal to that given out by the flues at the furnace end, which are naturally the hottest.

Chimney.

The chimney or smoke stack can be made of iron or brick, and should be carried a foot or so above the highest part of the roof. For convenience in cleaning an aperture should be left at the base of the shaft which may be closed with a metal shutter or, in the case of a brick structure, by a brick, projecting slightly for ease of removal when necessary. A sheet-iron damper for controlling the draught should be provided.

Top Ventilators.

The top ventilators are constructed as apertures in the roof, fitted with outward opening, hinged shutters made of tongued and grooved boards sheeted with flat galvanised iron, which should close of their own weight and sit snugly over the opening to render it weather-proof and as airtight as possible. The movement of each shutter for ventilation is effected by the agency of a metal arm projecting from its centre, to which is attached a wire cord which passes over a pulley under the lower sill of the opening and is carried under the roof and over the wall to the ground outside, where it can be fixed to keep the shutter open to the extent desired.

Where the roof forms a gable at each end two ventilators can be provided on each side to occupy the centre of each half of the respective slopes, or the ridge can be constructed to allow of an opening the full length on both sides which can be closed by a number of independent shutters.

Where the roof is hipped the slopes can be carried up until a square opening 4 to 6 feet in diameter is formed, when a box frame of suitable height to allow of an aperture with a hinged shutter, forming a ventilator on each of the four sides, can be constructed and provided with a flat projecting roof.

The ventilators should be of ample capacity, so that, when necessary, the use of those furthest from the direction of the wind will be sufficient. Ordinarily ventilating space equal to one-twentieth, or 5 per cent., of the ground area of the barn will be sufficient.

Bottom Ventilators.

It is considered that the best system of bottom ventilation is effected by the admission of the air through ducts similar in design to the heating flues, though perhaps of lighter material, leading under the walls to the lower surface of the heating flues, on which it would immediately impinge to be dried and heated to the desired temperature before coming into contact with the leaf.

Four such ventilators are advisable, two at the furnace end and two at that opposite, so arranged that each duct will enter and be carried under and in line with one of the flues.

As air on being heated expands and rises, that entering the barn and coming in immediate contact with the hot flues would cause a suction through the bottom ventilators proportionate to the degree to which it is heated, thus indicating a much lower capacity in the bottom ventilators than in those on top. It is considered that the combined capacity of the bottom ventilators should be equal to one-fourth of that regarded as sufficient on top.

Where the base of the barn has been excavated and the duct has to descend some distance before turning to pass under the wall, it will be necessary to increase the diameter with the depth of the outside portion or to sink a shaft from which the duct would lead. The ventilation can be regulated by fitting a plate to slide over the opening of each duct or by a revolving shutter inside.

Tiers.

The tiers are formed of poles across the barn from the furnace end to that opposite, the outside ones being placed against the walls and those intermediate centred, at 4 feet intervals, from the sides of the walls. The first tier should be 7 feet 6 inches or 8 feet above the ground floor of the barn, with successive tiers at vertical intervals of 2 feet until the top of the wall is reached.

Sawn hardwood 4 inches by 2 inches forms the best tier pole, though bush timber can be used.

Side play is prevented by nailing a batten across the centre of the poles from wall to wall in each tier, and extra strength secured by connecting the similarly placed poles in each of the successive tiers by a batten bolted to each about the centre of its length.

Door.

A door 6 feet 6 inches high by 2 feet 10 inches wide should be provided in the wall opposite to the furnace to open outwards and give entrance under the space between the second and third tier pole.

A satisfactory door can be made with a braced frame sheeted on both sides with dressed T. and G. flooring boards.

Floor.

The work of filling and emptying the barn is facilitated if a floor is installed 2 or 3 feet below the bottom tier, even if it does not extend to cover the rooms next to the walls. Satisfactory flooring boards will be 2 inches by 1½ inch spaced 2 inches apart.

Peep Holes.

In order to avoid opening the door on each occasion the thermometer is read an aperture, say 12 inches high by 4 inches wide, closed with a thick wooden shutter, can be constructed in the wall just below the bottom centre tier pole.

As the thermometer should be suspended in the centre of the barn on a level with the leaf in the bottom tier, it can be attached to an endless cord, passing over pulleys fixed to the tier pole in or near the centre of the barn and at the peep hole, to be brought forward for inspection and returned whenever desired.

Bulk and Grading Shed.

The construction of the bulk and grading shed is more simple than that of the barn, since provision is not required for the application of heat or so much ventilation.

In the bulk shed, to which the leaf is transferred after curing and in which it is held through the process of bulking and grading until despatched to market, the degree of atmospheric humidity should as far as possible be under control and not easily affected by weather conditions outside.

A wooden frame building with walls 10 feet high, lined and ceiled with wood or other insulating material, sheeted outside with weather-boards or galvanised corrugated iron, and roofed with iron or other equally durable weather-proof material, will be found quite satisfactory.

Reinforced concrete, bricks, pisé, logs, &c., are also serviceable in construction.

Floor.

The floor should be of boards, preferably 4 inches by 1 inch, laid with an inch space between and raised at least a foot above the ground to allow of a free circulation of air around the bulk of tobacco, which would be built up thereon.

Light.

Very little light is needed in the bulk shed, as tobacco leaf will bleach in colour under a strong light. One window in each end of the building is usually sufficient. These should be provided with shutters, to be closed when no work is being performed.

Ventilators.

Small rabbit-hutch or slide-covered ventilators should be provided at the base of the walls under the floor and a hinged shutter ventilator in each gable end.

Doors.

Double doors should be provided into the bulk shed and from it to the grading shed.

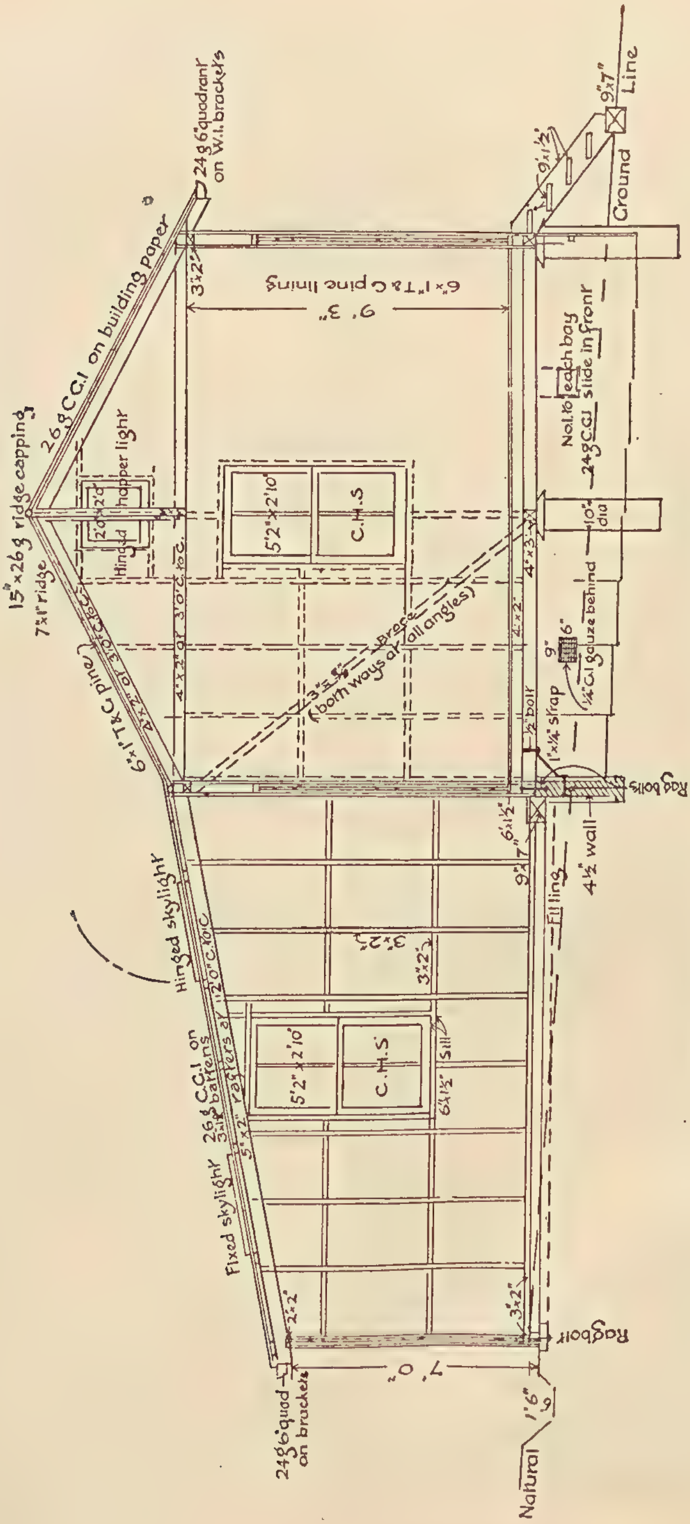


Plate 42.—Bulking and Grading Shed (Section).

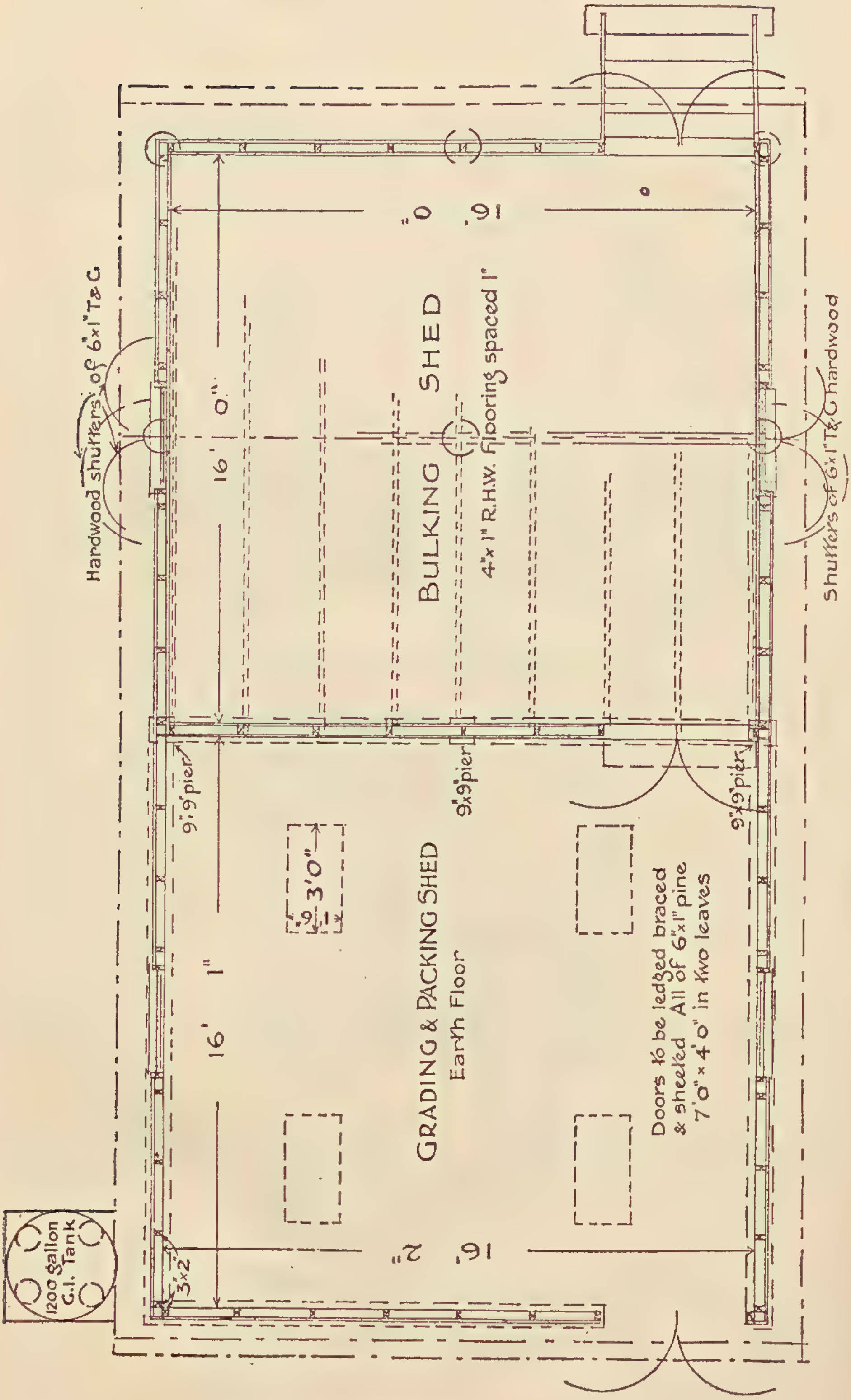


Plate 43.—Bulking and Grading Shed (Ground Plan).

Grading Shed.

In the grading shed, as the leaf would only be held during the process of grading, there is not the same necessity for a thick wall or for the use of lining and ceiling boards, a single wall and simple roof being sufficient, while the construction of a floor, though most convenient, is not absolutely necessary.

Economy is indicated in building the grading shed as an annexe to the bulk shed.

Light.

Much light is naturally required, which should be provided by windows in the wall and skylights in the roof; the latter can be purchased set in the centre of a sheet of ordinary corrugated iron.

As far as possible the grading shed should face the south so that the lighting will be away from the direct rays of the sun.

Tobacco Buildings.

The size and number of the flue-curing barns and the capacity of the bulk and grading sheds will be governed by the area that is to be placed under crop.

To secure the best results in curing, uniformly ripe leaf of similar texture should be picked, the barn filled, and the curing started within the space of eighteen hours.

As the lowest leaves on the plant ripen before those above them, it follows that the size and number of barns will be indicated by the amount of similarly textured leaf, suggested by the number of plants or the acreage under crop that can be expected to ripen at more or less regular intervals to allow of the whole crop being progressively dealt with.

Flue-curing barns of large size are not favoured, experience in most countries suggesting that where the area is in excess of 10 or 12 acres barns 16 feet square with walls 16 feet high, interior measurements, which can now almost be considered a standard size, are preferable to others of larger capacity.

A barn of this size with five tiers would provide a collective length between tier poles of 320 feet, allowing, according to the size of leaf, an output of between 350 and 450 lb. of cured leaf from each filling. One such barn would be required for each 5 acres under crop on soil recommended for bright tobacco.

Where the acreage under crop is large and plenty of labour available the capacity could be increased by making the walls 18 feet high to allow of an additional tier, or 20 feet to allow two additional tiers. In the first instance the six tiers would provide a collective length between tierpoles of 384 feet and increase the output by 70 to 90 lb. of cured leaf, while in the second the collective length between tier poles would be increased to 448 feet and the output by 140 to 180 lb. Where, however, the area is not expected at any time to exceed 10 or 12 acres, and there would be insufficient work to keep the number of hands required to fill the larger barn fully employed during the curing season, constructions of lesser capacity, such as 12 feet square by 16 feet high, interior measurement, would be preferable. A barn of this size having five tiers would provide a collective length between tier poles of 180 feet and give, according to the size of leaf, an output of from 190 to 250 lb. from each filling.

One such barn would be required for each 3 acres under crop on suitable bright tobacco soils.

Economy is suggested in the provision of an adequate number of barns of suitable capacity, as the leaf in a partly filled barn can be more satisfactorily cured than in one filled with more than the appropriate quantity.

While the cost of fuel is regulated by the weight of leaf, suggestive of the amount of moisture to be evaporated, that of attention during the cure is the same for one as for two or more barns, irrespective of their capacity.

In comparison with the output, the construction of the larger size is relatively less costly, since if 20 acres were placed under crop, four barns, each 16 by 16 by 16, that would effectively deal with the crop could be erected at considerably less cost than the seven barns, each 12 by 12 by 16, that would be required should the smaller size be decided upon.

Site.

The situation of the tobacco buildings should be as convenient as possible to the homestead for obvious reasons and not too far distant from the fields where the leaf is grown, though with motor transport now almost universal the carriage of the leaf a few hundred yards further from field to barn is of little importance.

The site should be naturally well drained or capable of being easily made so, and should offer a good foundation for the buildings. A water supply at the barns is necessary, and provision therefore should be made by the erection of tanks if no better facility is offered.

Often a site will be suggested on the crown of a ridge or just near the edge of a steep slope or bank, such as is often found in a terrace left by a stream that has worn its way to a deeper level.

Here a saving in construction of the flue-curing barn could be effected by making an excavation for the basement to a depth of 5 feet or less, as the nature of the ground permits, which would lessen by a like amount the height of wall to be built and obviate the necessity for so much brick, concrete, or other fire-resistant material at the back of the barn, where the furnace would be situated and the hot flues enter and emerge from the structure.

Where such an excavation would be possible a drain to a slightly greater depth would be necessary round the barn to carry off any storm or seepage water, as the floor and walls of the basement should be kept dry.

The cost of cutting such a drain for one or more barns compared with the saving in building costs effected would be a deciding factor.

In marking out the site for the tobacco buildings that of the bulk shed with grading annexe should be placed parallel to the front of the barn and, to lessen the premium for fire insurance, distant therefrom at least 30 feet, wall to wall, an enclosed or louvred shade or veranda in this connection being regarded as a wall.

It is usual to build the furnace on the side of the barn opposite to the direction of the prevailing wind, but this is not a matter of very great importance.

Additions.

Provision should be made to allow of additional barns being added and also of the bulk and grading shed being extended.

When adding another barn, a reduction in cost can be effected by making use of an existing wall, by which three additional walls only will be necessary.

When adding to the bulk and grading shed, one end of each is removed and replaced when the extra length of walls and roof have been added.

It is usual with the addition of each barn to make a corresponding increase in the capacity of the bulk shed and, up to a point, in that of the grading shed. In this latter, however, where leaf would only be held whilst being graded or when packed ready for transport to market, provision for the same extra space is not called for. As the leaf will be taken from the bulks in the bulk shed as required and returned thereto or packed immediately after grading, just sufficient space to allow ease of handling during grading and subsequently while packing and storage of a load or two of cases or bales is all that is necessary.

Thus, where a nest of four barns, each 16 by 16 by 16 is erected, it is suggested that the bulk shed should be 64 feet long and the grading shed 48 feet long, each being 16 feet wide.

The addition of a fifth barn would necessitate probably another 16 feet to the length of the bulk shed, but the capacity of the grading shed could be regarded as sufficient.

When smaller sized barns are installed the capacity of the bulk shed will be regulated accordingly.

Where the area to be placed under crop is extensive it would be preferable, in view of the possibility of loss by fire, to build the barns in nests of three, four, or five, each nest being provided with a separate bulk and grading shed, so isolated as to minimise risk.

TOBACCO PESTS.

By J. HAROLD SMITH, M.Sc., Entomologist, Department of Agriculture and Stock.

DURING recent years attention has been focussed on the possibility of a large-scale expansion of tobacco growing in the State of Queensland. Under official auspices steps have been taken to prove the suitability of certain areas for the crop, and, as a result, quite a number of growers planted commercial areas during the past two years. As would be expected, the problems with which such a growing industry will be faced have, in this period, become more or less clearly defined, and of these concerted action to control the several pests partial to the crop will be important. Observation in most of the tobacco-growing areas of North Queensland has crystallised these problems and it is now possible to discuss with reasonable accuracy the status of the various insect pests, the potentialities of each, and the measures which will necessarily become constituent parts of agricultural practice in coping with them.

GENERAL CONSIDERATIONS.

Tobacco belongs to the natural order Solanaceæ, which includes quite a number of plants, both indigenous and introduced with subsequent establishment in the State. Among these are both cultivated and wild tomatoes, various nightshades, cape gooseberries, and the wild tobaccos. It is usual to find that insects tend to restrict their activities to host plants within the one natural order, or, at least, to show a preference for related plants. It is, therefore, curious that some of the more serious pests of tobacco can best be regarded as general feeders, being already known as serious pests of cultivated and wild plants belonging to more than one natural order. Thus some of the Noctuids (cutworms, budworm, &c.) so far recorded are common to such widely differing plants as maize, cowpeas, and tobacco, while some of the subterranean pests feed on any plants which may be accessible to them.

The possibility of control is thus complicated by the fact that there is slight prospect of preventing the ingress of a recognised pest to an area where tobacco has not been previously grown. The most serious pests already exist in most districts, and their presence compels the attention of growers to proved agricultural measures which will mitigate normal losses and to the use of insecticides known to be of value in coping with the individual insects. It should, therefore, be clear that the control of insect pests in tobacco requires special consideration, owing to the peculiar nature of the crop and the generalised pest complex with which the grower has to deal.

Tobacco differs from most other crops in certain respects which have a material bearing on the subject-matter. In the first place, the commercial article is the leaf, the quality of which determines the price paid for the crop. Quality is a term very difficult to define, but uniform growth of the plant and even maturity of the leaves are indispensable to the production of the higher grades. Agricultural operations usually ensure these, but the tobacco grower knows only too well that insect pests often frustrate his aims. For example, the destruction of plants by insects when first transferred to the field may reach a noticeable fraction of the whole. Replants which take the place of these destroyed seedlings lay the foundation for irregular maturing of the leaves. Even in the best regulated crop a percentage of plants will succumb to the

altered conditions when exposed to field conditions. Both insect and fungoid enemies add to this irreducible minimum, the contribution of each varying from place to place. The differences in growth show up when harvesting, the replants maturing behind the bulk of the crop, often under climatic conditions anything but suitable for the purpose. Thus the expense of replanting is only a fraction of the loss actually sustained by the grower; the lack of uniformity in the leaf gathered at each picking adds difficulties to curing which may be beyond the ingenuity of individual growers to overcome.

The agricultural requirements of the crop are such that cultural methods differ in the several districts where tobacco growing promises to become an integral part of farming practice. In most parts of Queensland the monsoonal rains determine the time of planting, and field operations normally begin some time in December. In some districts, however, growers prefer to plant at a later date. Such devious practices originate in the peculiarities of individual areas, and may easily account for differences in both the pest fauna and the status of species in each district. The extremes of summer and winter in a temperate climate are sufficiently far apart to impose seasonal habits on the various insect pests. In Queensland insect development may proceed through the whole year, but the rate of such development may be vastly different in, say, January and July. This may be sufficient to give the several insect pests associated with tobacco in various districts a relative importance which may be somewhat confusing. How far such differences may be significant should be learnt during the next few years.

Again, the fact that the leaf is the commercial part of the crop limits the scope for the use of insecticides which would normally be used for some of the principal pests. The cured leaf varies from dark mahogany to lemon in colour, and its appearance at the time of sale contributes largely to the price realised for it. The indiscriminate application of arsenicals—e.g., lead arsenate to plants, the leaves of which are ripening—leaves a white deposit on their surfaces, characteristic enough to prejudice the sale of the cured leaf, though in other respects the tobacco may be excellent. Hence poisons of this class must be used sparingly and heavy treatments restricted to the early stages of the growth of the plants. Alternative measures, often less efficient for the control of a particular pest, must sometimes be substituted for recognised remedies on obvious grounds of expediency.

It is the purpose of these notes to record the more significant pests of tobacco, remark their distinctive habits, and outline control measures which cannot but assist the farmer to make tobacco growing a payable proposition. The pest complex will recur with insistent regularity from year to year with more or less severe effects, and the grower who systematically embodies the several suggestions in his ordinary farming practice will have no reason to regret it.

MAJOR AND MINOR PESTS.

Among the pests associated with tobacco are some which attack the plant below ground and others restricted to the aerial parts of the plant. The major pests can, therefore, be grouped as follows:—

(*a*) Subterranean forms—e.g., wireworms, false wireworms, cutworms, and nematodes;

(*b*) Aerial forms—e.g., leaf-eating Noctuids and the tobacco leaf miner.

They will be considered in this order, while a number of minor pests with which the grower should be acquainted will be treated later in a separate section.

Wireworms.

Immediately plants are transferred from the seed-bed to the field they face the most critical stage in their whole development. This is especially the case when the crop is grown in North Queensland, for the difficulty of establishing a new root system is accentuated by adverse climatic conditions and the ravages of several serious pests. Losses when planting out have, therefore, been high in the past, and though it is difficult to assess the precise contribution of cultural deficiencies, fungoid troubles, and insect attacks to the total loss, there is no doubt that the share of the last is considerable.

Thus, on certain types of soil, an examination of the plants which fail to establish themselves, or which, having struck root, wilt within a week or so, will often disclose signs of wireworm injury. The larvæ may either feed externally or enter the stalk below ground level and burrow up the centre of the stem for an inch or so. Plants so entered tumble over at the ground level and seldom, if ever, recover. During the present year the losses have doubtless been accentuated by the unusual conditions under which the crop has been grown, but even so there have been noticeable differences on the various farms under observation.

The insects classed as wireworms are the larvæ of Elaterid or click beetles. Queensland possesses quite a number of species, but their systematic affinities are not clearly understood and the larval characteristics have not been studied. Consequently this discussion must proceed on general lines, though individual species may possess quite different habits. The Queensland species associated with tobacco have not yet been identified, but later work should shed some light on the status of individual forms and the habits peculiar to each. The adults are typically flat, elongate beetles, slaty grey in colour, and distinguishable from most other families by the backwardly projecting angles of the thorax. These beetles lay their eggs in the soil where any cover is available, and from these the larvæ, yellowish white in colour, hatch. The posterior segment is typically ornate. The duration of the larval period varies with the species and is generally lengthy, covering in known cases some months to five years, a characteristic which complicates the whole problem of control.

Insecticides are of very little use against pests of this class, for they appear to be immune to the poisons which normally render such excellent service in the control of insect pests. Recourse has, therefore, to be made to special practices which will minimise the trouble. Among these are:—

(*a*) In clearing the land for a first crop of tobacco it sometimes happens that the debris is heaped for months before removal from the field. Such heaps offer sanctuary to the adults and favour an influx of the pest to the soils in the immediate vicinity. This is anything but desirable, and clearing should, therefore, be expedited as a matter of principle.

(*b*) A pre-baiting method for the treatment of wireworms in heavily infested soils has been developed in America. It depends on the partiality of the insects for germinating grain crops and consists in planting these in drills a yard or so apart and fumigating the soil

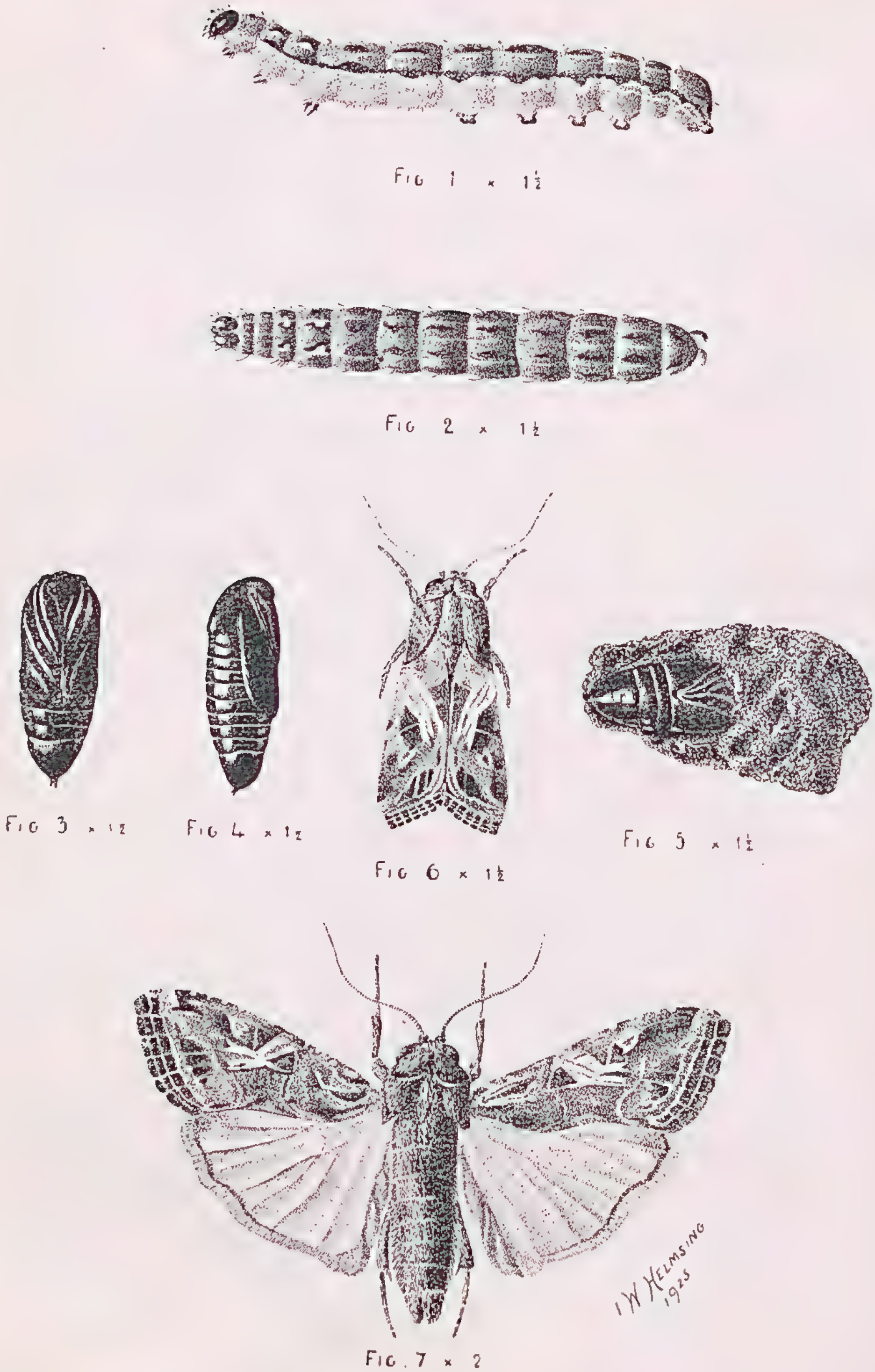


PLATE 44.

Prodenia litura Fabr.

Fig. 1, Larva, lateral view, × 1½. Fig. 2, Larva, dorsal view, × 1½. Fig. 3, Pupa, ventral view, × 1½. Fig. 4, Pupa, lateral view, × 1½. Fig. 5, Pupa within earthen cocoon, × 1½. Fig. 6, Imago, wings closed, × 1½. Fig. 7, Imago, wings expanded, × 2.

with granular cyanogas a month later. Before fumigation the wireworms have congregated round the germinating plants, hence a fairly complete kill can be secured. In North Queensland the application of this method would delay planting the tobacco for some four of five weeks, hence the measure would have practical value only in acute cases.

(*c*) Once the plants have become established in the field, it is rare to find them obviously suffering from the pest. The tunnelling habit is apparently confined to young plants, and there is some evidence that losses could be reduced if plants about to be transferred to the field from the seed-bed were hardened by exposure to the sun for some time before their removal. They would then be in a better position to withstand both the physical disabilities inseparable from the transfer and the depredations of subterranean pests. Wireworms do, of course, attack both soft and hard plants, but the burrowing habit seems to be restricted to the former. A plant nipped at the base has a reasonable chance of recovery; a plant into which the pest has actually entered has none.

(*d*) Thorough cultivation serves a dual purpose. The pests present in the soil are continually being disturbed and often destroyed, while the operation helps to keep the plant growing in even the most unfavourable seasons. A growing crop is a pest-resistant crop, and the continual use of scarifier and hoe is one of the principal factors in promoting the steady growth of the plant and reinforcing its innate capacity to resist pests.

Given due attention to agricultural methods, such as those outlined above, the seedling losses through wireworm attacks would certainly be reduced to a minimum and spare the grower much of the hard work and inconvenience inseparable from heavy replanting.

Cutworms.

A second group of pests whose habits link them with plants just transferred to the field includes the very familiar cutworms. These are the larvæ of Noctuid moths which are subterranean during their immature and growing life. In this stage they are a constant source of trouble to crops in which transplanting is a necessary operation. A number of species appear to be implicated in the injury to tobacco and among these *Prodenia litura* F. will by no means rank least. Noctuids are, for the most part, dull-coloured moths given to flying at dusk, and the group contains some of the most serious pests with which the farmer has to deal.

Plants attacked by these larvæ collapse just below ground level, the grub having nibbled the tissue until insufficient remains to physically support the head of the plant and permit the interchange of food materials between the roots and the leaves. Soft seedlings are especially subject to attack, but plants may suffer at all stages, though once they are thoroughly established the probability of total destruction is slight—unless, of course, the pest assumes plague proportions. Hence the aim of control is to shepherd the plants through their first six weeks of growth in the field.

The female moth (Plate 44, fig. 6) may lay its eggs in the soil near the base of the plant or on jutting surfaces. The larvæ which hatch from these develop rapidly, so much so that when they are sought in the vicinity of plants which have been destroyed full-grown individuals (Plate 44, fig. 1) are often recovered. These greyish black soft-bodied creatures curl up when handled, a characteristic habit of the group, and may reach a length of 2 inches or thereabouts.

Fortunately, efficient control measures have been formulated for these pests, and they should be regarded as part and parcel of the planting operation if attacks are anticipated. The grubs are very partial to cereal preparations such as bran, corn meal, and pollard, and advantage has been taken of this fact to compound a poison bait which gives excellent results in the field. The formula is as follows:—Bran, 12 lb.; pollard, 12 lb.; Paris green, 1 lb.; molasses, 1 quart; water, 2 gallons approximately.

In preparing the mash, the first three ingredients are thoroughly mixed together. Water in which the molasses has been stirred is then added until the mash has a crumbling texture; the bait is then ready for use. Some growers apply the mash broadcast, others as pellets the size of a walnut, always, of course, in the line of the rows. Both methods give good results in North Queensland where heavy dews revivify the mash daily during the planting and early growing season.

False Wireworm (*Gonocephalum* sp.).

A third pest which is liable to cause losses to the tobacco grower during transplanting is a squat greyish-black beetle, barely half an inch long. Certain types of soil, some of which will be used for tobacco growing, harbour these insects, and they normally feed on any available herbage. As with most subterranean pests, they present an entomological problem of some importance during a dry season.

Both larvæ and adults share in the injury attributable to this pest, each gnawing into the plant tissue at ground level. The plant either wilts through the interference with metabolism or collapses at the point of attack. Replanting is invariably necessary in such cases.

In many respects the larvæ of these beetles resemble wireworms, and confusion between the two is a common and reasonable error. As a general diagnostic character, it will be found that the last abdominal segment of the wireworm is ornate, while that of the false wireworm is plain. There are, however, exceptions to this rule, and there is consequently abundant scope for studies of the insects concerned.

Control measures suited to the false wireworm have already been enumerated in connection with pests already discussed, but may be briefly recalled here. They are—

(*a*) Adequate care that transplants are hardened by exposure before removal from the seed-beds.

(*b*) The application of Paris green baits at the base of the plants. These baits give results with this pest comparable with those secured against cutworms.

Nematodes.

Nematodes of the genus Heterodera are well known to farmers everywhere, for on certain types of soil they constitute one of his most serious pests. They occur throughout the State and attack most cultivated crops, often very severely. Tobacco is no exception to the general rule.

The characteristic symptoms may be found on most hosts and are particularly distinct in the case of tobacco. The roots of young plants possess irregular swellings (Plate 45, fig. 2) formed by reaction to the irritation due to the eelworms in their tissues. If old, the roots look quite different; the swellings have merged into one another until the

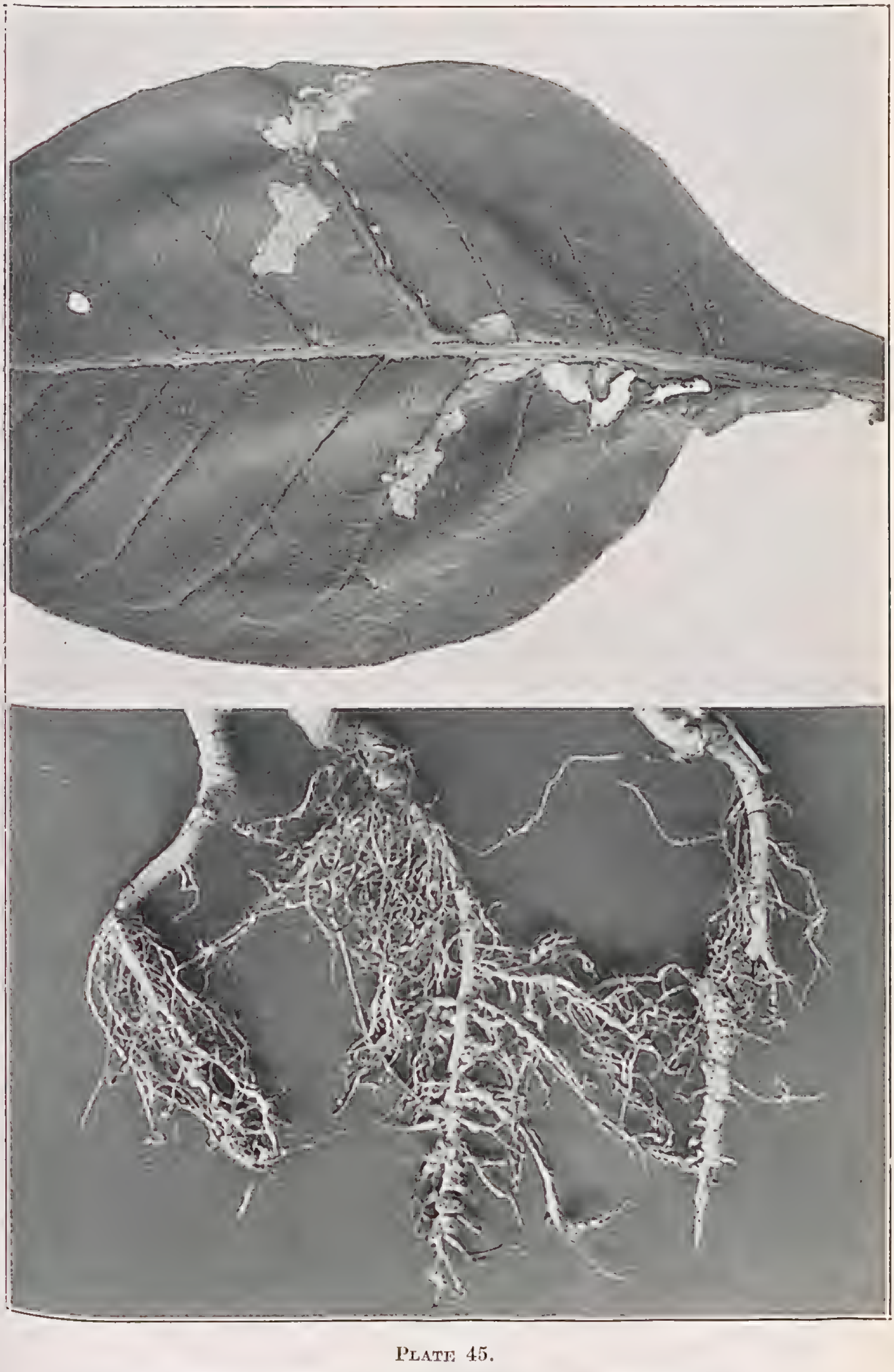


Plate 45.

Fig. 1.—Tobacco leaf attacked by the larvæ of the tobacco leaf miner.
Fig. 2.—Nematode galls on tobacco roots.

roots are irregular distended masses with numerous eruptions, should the disintegration of the tissues be far advanced. Secondary rots may hasten the appearance of this stage. The obvious interference with the metabolism of the plant through such abnormalities is serious, and death may and often does result. The capacity of individual plants to resist infestation, or rather to survive infestation, varies a good deal, and well established plants living under good growing conditions may mature even though the bulk of their roots are apparently destroyed. In such cases the pest has entered the root system some time after planting out in the field. Plants attacked in their early life rarely reach maturity, though they may persist as dwarf forms just retaining a vestige of life.

Most legumes—e.g., beans, cowpeas, &c.—naturally possess nodules on their finer roots (Plate 46, fig. 4). These have an entirely different origin to those under discussion, being due to non-pathogenic symbiotic bacteria, and may be distinguished by the ease with which they can be detached from the plant.

It is difficult to generalise on the soil types particularly affected with nematodes, but there can be little doubt that many of those suited to tobacco growing are normally infested with the pest. This handicap is offset somewhat by the fact that growth conditions in such areas are, as a rule, excellent, so that normally the balance is on the side of plant survival. In spite of this, nematodes promise to be a source of worry to many growers.

The organism is a minute eelworm of the type illustrated (Plate 47, fig. 4). The farmer is more familiar with the injury than with the organism itself, as he has rarely the facilities for examining the worm. The male retains his elongate thread-like shape throughout life, while his mate assumes a pear-shaped aspect when mature. She may then be detected in infested tissues, each individual appearing as a transparent globule the size of a pin head. Life history studies in this State are incomplete, but by analogy with the known habits of the organism elsewhere, it may be assumed that generation succeeds generation at approximately monthly intervals.

The pest has certain powers of movement, but cannot depend on these for distribution over considerable distances, hence it is generally conceded that part of the spread is effected by mechanical agencies, an abundance of which are available on the farm. Thus they may be carried from place to place on implements, while flood or drainage waters may transport free living stages from one part of the farm to another or from farm to farm. In spite of this, the persistence with which this pest turns up on newly broken land, far removed from other cultivation, suggests that the nematode is established almost everywhere, and maintains itself on host plants indigenous to the area. When such land is ploughed and a commercial crop introduced, the eelworms tend to divert their attention to it, the exigencies of farming having destroyed their primary host. As a precautionary measure, it is always advisable when introducing implements, seedling plants, &c., to the farm to take adequate safeguards to ensure their freedom from the pest.

Remedial measures involving the use of fumigants or soil insecticides have received considerable attention from entomologists in most countries, but, as yet, none have yielded results which would warrant serious discussion as methods of control. In all stages, particularly the egg which occurs freely in the soil, the worms show remarkable

Fig 1.

Fig 2

Fig. 3.

Fig. 4.

I W. Helmsing 1927.

Plate 46.—Nematodes.

Fig. 1.—Nematode galls on Strawberry roots.
Fig. 2.—Nematode-infested Potato.
Fig. 3.—Tomato root infested by Nematodes.
Fig. 4.—Bacterial Nodules on roots of Lupin.
(All ½ natural size.)

PLATE 47.—NEMATODES.

Fig. 1.—Infested Banana root.
Fig. 2.—Longitudinal section of Banana root showing Nematode infestation.
Fig. 3.—Eggs in different stages of development.
Fig. 4.—Larva.
Fig. 5.—Female.
Fig. 6.—Female (later stage).

powers of resistance to ordinary toxic substances. Growers must, therefore, recognise the value of preventive measures for keeping the eelworm population down to a minimum. Such measures would include—

(*a*) Scrupulous care that any plants introduced to the farm are themselves free from nodules on the roots—almost certain evidence of eelworm infestation.

(*b*) Seed-beds should preferably be made some distance from the land in which the plants are to be placed. During transplanting each seedling should be examined for knotty root, and any showing the typical symptoms discarded. Ordinarily such an inspection is necessary to eliminate plants injured at ground level or suffering from the attacks of damping-off fungi. Eelworm affected plants could be separated at the same time and with them, both discarded and destroyed.

(*c*) Occasional fallowing of the land supplemented by cropping with such plants as may be immune to the pest both reconditions the soil and reduces the nematode fauna. Few plants can claim immunity, but it is quite possible that these will be of value in districts suited to tobacco growing; examples are maize, peanuts, sorghum, millet, and some varieties of cowpea.

(*d*) Soil sterilisation by steam is practicable in the case of seed-beds only, and when properly performed does give good results. Nematode infestation in the seed-bed is invariably a foretaste of heavy losses in the field, hence it is advisable for growers to become acquainted with the equipment and the method of its use when opportunities occur.

Summing up the position with regard to this pest, it has to be emphasised that areas free from nematodes should be safeguarded from infestation at all costs. Once infested recourse must be had to the precautionary measures outlined above, attention to which should ensure a satisfactory crop in North Queensland where growing conditions leave little to be desired.

The Budworm and Other Leaf-eating Noctuids.

Many Noctuids infest the leaves of the growing tobacco plant, but one, the budworm (*Heliothis obsoleta* F.), supplements leaf destruction by a second type of injury so distinctive that the larva is commonly associated with its secondary habit. Few pests can effect equal losses if unchecked, and few better pay the systematic use of adequate control measures.

The name "budworm" is apt, as the larvæ show a definite partiality for the young growing point of the plant, at or near the tip. Often a single individual leaves the foliage and penetrates the growing point of the plant, boring for some distance down the stem. The habit is incidental rather than primary to the pest, for most of the larvæ of the moth may be found scattered about on the leaves feeding in the open. The secondary effects of the boring habit are, however, so serious that the losses sustained trouble the farmer most acutely. The terminal bud is destroyed and the natural growth impetus of the plant is such that lateral buds which would ordinarily remain dormant begin to grow from the angles of the lower leaves. These new shoots make rapid headway and may in turn be attacked by larvæ, and so the process goes on, its severity depending on the activity of the pest during any particular season. In addition to the time wasted in premature desuckering imposed on the tobacco grower through the destruction of the

original growing points of the plants, the irregular growth subsequent to attack increases his actual loss. This irregular growth adds to the variability of the leaf and complicates both harvesting and curing operations.

The greater part of the larvæ are, however, open feeders and confine themselves to the leaves. Even if these are not totally destroyed, the growth after attack may cause malformations or so affect the general appearance of the leaves that their grade would be automatically reduced. The pest is so ravenous that it is not uncommon to find a plant stripped of most of its leaves, hence it is clear that, should the pest assume plague proportions, the total loss would be disastrous.

The moth (Plate 48, fig. 4) has a wide range of host plants, is known as a pest of maize, has won notoriety as the most serious pest of growing tomato plants, and may be found on many cultivated and wild herbaceous plants. It is commonly known as the corn-ear worm. The wing span is about 1½ inches, and the general body colour ochraceous, though the hind wings contrast with the fore in being more membranous and lighter in colour. The fore wings may sometimes have a greenish tint.

Egg-laying normally takes place at dusk, when the moths may be seen flitting from plant to plant laying eggs (Plate 48, fig. 1) while hovering over the leaves. After three or four days—the period varies with the time of the year—the first-stage larva emerges as a pale white grub which feeds on the leaves in the vicinity at a very early stage. Growth is achieved by successive moults, and at each the colour characteristics become more clearly defined. The colour of the caterpillar (Plate 48, fig. 2) is frequently green interspersed with ochraceous markings, but the range of variability is considerable. During growth the movements of the larvæ are dictated by the search for the tenderer leaves of the plant, hence the bulk of the immature stages will be found near the growing point. It is invariably correct to assume that older leaves which are stripped to the veins were originally attacked when first unfolded from the bud.

When full grown, some three weeks after emerging from the egg, the larva leaves its host plant and enters the soil. It here constructs an earthen cocoon at a depth of an inch or so, within which the transformation to the chrysalis takes place. The whole anatomy of the insect is remodelled in this stage, the voracious leaf-eating larva being changed to the nectar-loving moth. The chrysalis (Plate 48, fig. 3) lasts about ten days, while the moths may be on the wing for some two or three weeks. During this period its primary function is reproductive and an immense number of eggs may be laid by a single individual, each being placed singly in the bud region of the plant.

During the day the moths shelter among the older leaves of the plant and may be disturbed by anyone walking through the crop. Were it not for the natural enemies to which the immature forms are subject—some of them minute wasps, some insectivorous birds—together with unfavourable climatic conditions, the pest would increase, such is its fertility rate, to an extent disastrous to tobacco growing. In spite of these natural controls, the budworm is one of the most serious pests with which the grower has to deal.

The principal injury is caused during the last week of the larval period when the capacity of each individual to consume foliage is

Plate 48.—The Budworm (*Heliothis obsoleta* F.)

From a Watercolour Drawing by I. W. HELMSING.

exceptional. Hence control measures aim at the destruction of the larvæ when still young, special attention being given to the tip of the plant where they tend to congregate. In the seed-beds neglect to take reasonable precautions may lead to the entire destruction of the plants, for it often happens that the injury is detected only when the infestation reaches an abnormally high figure. The cover provided by plants growing in close proximity to each other may account for this, as the real dimensions of foliage loss in individual plants are masked by their neighbours. Consequently it is desirable to stereotype the treatment of seed-bed and early field plants with an arsenical spray or dust. The spray may be prepared at the following strength:—1½ lb. lead arsenate per 50 gallons water. A more even cover is ensured when a casein or flour spreader is added to the solution. It will be invariably found that when the leaves of the seedlings are large enough to intermingle, a spray merely covers the exposed upper surface of the leaves. It is then advisable to alternate the above spray with a 25 per cent. lead arsenate dust at weekly intervals. Seed-beds usually have water close at hand and spraying is practicable for the plants in them.

In the field the position is different and dusts tend to be used in place of sprays for the control of the budworm, their convenience compensating for a somewhat lessened efficiency. As tobacco is more sensitive to toxic action than most plants with which the farmer has to deal, the concentration of the dust is kept down to a minimum. Dusts containing 25 per cent. lead arsenate are sufficiently powerful for ordinary needs, though if the occasion warrants so doing 50 per cent. dusts may be used. Arsenical burning is always a danger at the higher concentration.

Arsenical dusts can hardly be used indiscriminately for the treatment of tobacco pests, hence it is usual to vary the treatment when the plants have reached a height of 18 inches or 2 feet. It is then desired to retain control of the pest while avoiding the accumulation of the white toxic dust on the leaves. The accumulation of such a dust, inseparable from repeated applications of lead arsenate, both disfigures the leaf to the prejudice of its sale, and leaves an undesirable poison on the harvested leaf used in the manufacture of tobacco. The solution of the difficulty depends on the consistent application of the following dry bait to the growing point of the plant:—1 lb. lead arsenate per 25 lb. pollard. Corn meal may be substituted for the pollard when it can be procured. The ingredients require thorough mixing and are applied to the tip of the plant by means of a finely perforated tin canister or through coarse hessian at weekly or fortnightly intervals. This suggestion for coping with the tobacco budworm follows the precedent established in various tobacco-growing countries.

A number of other Noctuids are partial to tobacco, the chief in the far North being the green tobacco looper (*Plusia argentifera* Gn.). These species feed openly, and should normally be kept in control by the measures already suggested for coping with the budworm.

Leaf-eating Noctuids are very susceptible to arsenicals. As, however, the growth of the plant is rapid, successive dustings, sprayings, or dry baitings should follow each other at fairly short intervals. Weekly treatments in the seed-bed and fortnightly treatments in the field are normally sufficient to meet ordinary requirements.

The Tobacco Leaf Miner (*Phthorimæa operculella* Zell.)

The tobacco leaf miner is a cosmopolitan species partial to most Solanaceous plants, and tobacco suffers to some extent from its attacks. The insect is more familiar to the farmer as the potato tuber moth, notorious for the losses which it causes to tubers held in storage for any length of time. Occasionally the larvæ bore into the stem of this plant and mine its leaves, but such losses are usually regarded as quite secondary. In tobacco, however, it is the last type of injury which is significant.

Unless the infestation is very severe, the damage is restricted to the older leaves of the plant—i.e., those nearer the ground. If the larvæ are still mining within them, irregular blotches indicating the amount of tissue destroyed may be discerned. (Plate 45, fig. 1.) These may be lesion-like, but if the larvæ have vacated the mines some time previously they become brittle discoloured patches of dead tissue. Though meandering over the surface of the leaf, each burrow terminates at some main vein or at the leaf stalk itself, and here the excreta has been systematically piled up by the former occupant. Occasional erosion in the leaf stalk suggests abortive attempts to burrow there. In tobacco, observations in North Queensland indicate that the mining habit has the greater significance for the crop, but there seems no reason why, given suitable conditions, the feeding habits should be different from those better known on the allied potato plant. Hence it is probable that the leaf stalk and stem boring habit will be noted as observations extend. It is difficult to assess the loss attributable to this pest, for affected leaves may be valuable though disfigured. At a minimum, the grade of part of the crop will be reduced. Ordinarily, the least valuable leaves suffer, but the ravages of the pest are such that it may ultimately prove more serious than at present appears to be the case.

In a concentrated tobacco area, periodic increases in the moth population are probable, and may warrant special attention from the grower.

The moth (Plate 49, fig. 7) is small and slender, possessing greyish wings tinged with indefinite yellow streaks and spanning some ¾ inch. They can usually be raised in numbers when walking through a tobacco crop. Eggs (Plate 49, fig. 1) are laid singly on the leaves of the host plant, and each is minute, pale yellow in colour, and strongly iridescent. Each moth may lay as many as fifty eggs, but this is a laboratory record, and it is quite probable that they lay much larger numbers in the field. The larvæ (Plate 49, fig. 3) are very active, and cling tenaciously to the leaves. The colour varies in different specimens, but is always a combination of green and grey which, as the individual approaches maturity, may be masked by a purplish hue. Pupation takes place in a lightly woven cocoon (Plate 49, fig. 4) constructed in any convenient shelter near the surface of the soil. As with many other insects of this

THE TOBACCO LEAF MINER.

(Description of Plate 49, page 209.)

Fig. 1. Egg, x 35.
,, 2. Eggs laid on surface of potato tuber, x 10.
,, 3. Larva, lateral view, x 4.
,, 4. Earthen cocoon, x 2½.
,, 5. Pupa, ventral view, x 7.
,, 6. Pupa lateral view, x 7.
,, 7. Adult, x 4.
,, 8. Potato tuber showing external signs of infestation, ½ natural size.
,, 9. Potato tuber showing tunnelling, ½ natural size.

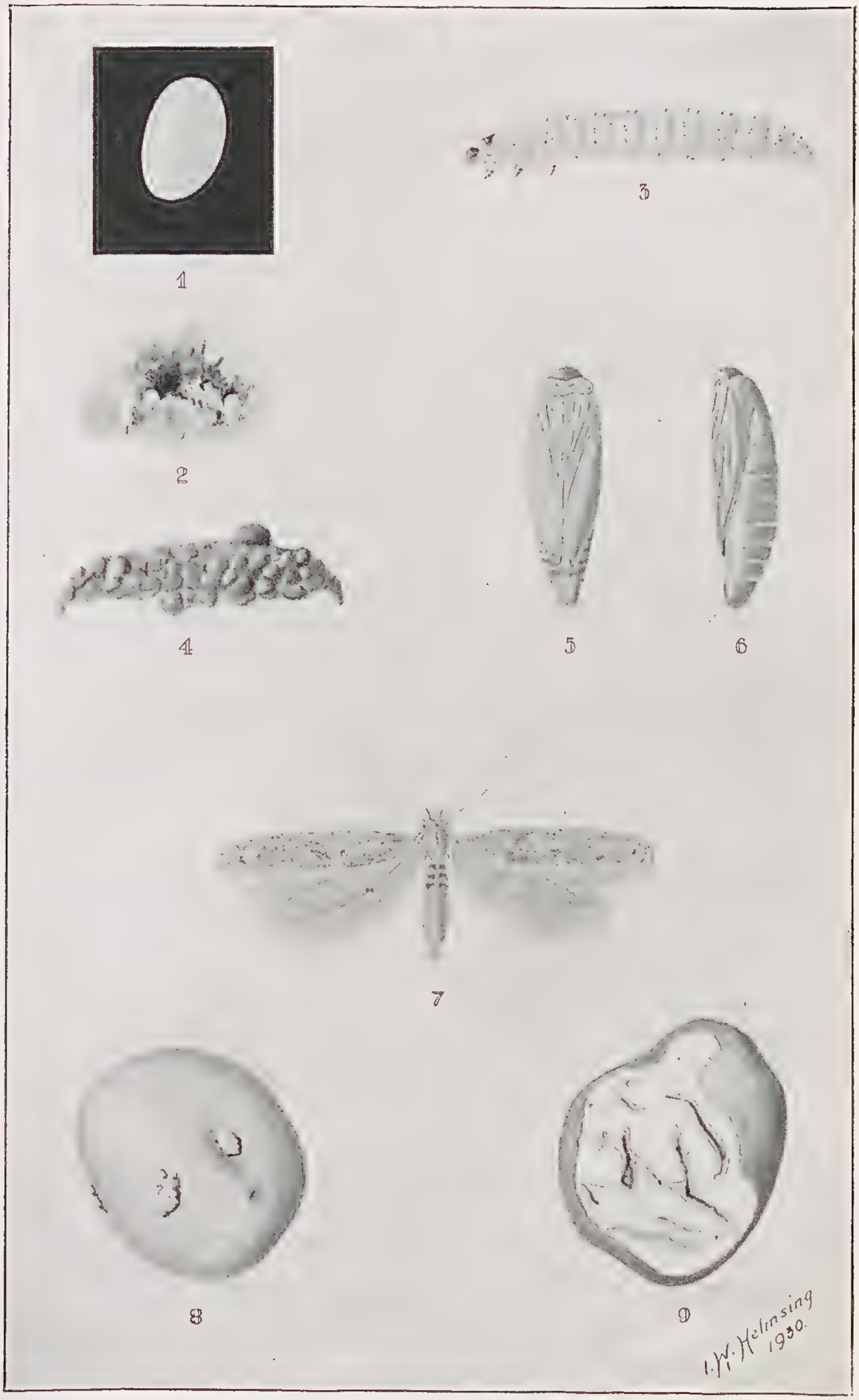


PLATE 49.—THE TOBACCO LEAF MINER (*Phthorimœa operculella* Zell.).
(*For description of Plate, see page* 208.)

type, the life cycle is completed within three weeks, and generation follows generation with comparative rapidity.

There are a number of allied species, and all show a partiality to plants within the one natural order. Doubtless others than that under discussion will ultimately be found on the tobacco crop. Whether they will have the same importance for the tobacco grower remains to be seen.

The control of this pest is anything but an easy matter. Few modes of existence offer such complete protection from natural enemies as mining in the leaves of plants, and toxic substances, such as those used for external feeding insects, have only a limited scope of usefulness. Under the ordinary treatment of tobacco plants with arsenicals, a necessary procedure for coping with the various Noctuids, some protection should be afforded against this pest. The provision of supplementary methods must be reserved for special cases.

This is one of the pests which can be kept in check by good farming. In tobacco farming the crop is removed within seven months of planting, and for the remainder of the year the land remains fallow. During this period occasional cultivation, supplemented by the destruction of volunteer tobacco plants, Solonaceous and other weed growth, would do much to keep the pest in check.

MINOR PESTS OF TOBACCO.

A number of insects associated with the tobacco plant are for the most part regarded as minor pests, and do not require special attention from the grower. It is, however, desirable that he be acquainted with them, for they are all capable, given suitable conditions, of causing considerable injury—they are grasshoppers, leaf hoppers, and thrips. The following notes will assist in diagnosing the insects, but severe outbreaks should be brought under the notice of Departmental officials who are in a position to give information concerning the most suitable measures to be adopted in particular cases.

Grasshoppers.

These are too well known to require description. Sometimes they play havoc with plants in the seed-bed, and in a dry year may cause some trouble after planting out in the field. The nutritious green feed available in the seed-beds attracts these insects in large numbers, and their voracious habits may result in considerable leaf destruction. This may prove fatal to young plants, hence should the pest be noted in sufficient numbers to warrant alarm the seed-bed should be protected by some form of cover. Any light and readily available material will serve the purpose, provided the mesh is large enough to allow the light to enter; a cheap type of mosquito netting is suggested.

When the pest threatens trouble in the field special baits will be necessary. A number of such preparations have been recommended from time to time, among them the poison bran bait, the preparation of which has already been described when dealing with cutworms. Another type of bait depends for its action on the toxic properties of sodium arsenite. The formula is appended, viz.:—120 lb. sawdust, 2½ lb. sodium arsenite, 6 lb. salt, 1 gallon molasses, 10 gallons water.

It is unlikely that widespread baiting in the field for this pest will be necessary, except in a particularly dry year, and then in certain districts only.

Leafhoppers.

A small green Jassid about one-fifth of an inch long, whose wings are roof-shaped in repose, feeds on a variety of plants. Among these are the three Solanaceous plants—tomatoes, potatoes, and tobacco. In

the lastnamed the typical symptoms of its presence may be found when the crop is reaching maturity. In the Bowen district the pest has achieved celebrity as an enemy of the tomato crop, and it is there known as the green fly. The term is rather a misnomer, for while the Jassid certainly flies the characteristic movement is better described as a hop in which the insect covers any distance from 1 inch to 2 or 3 feet.

The hopper is essentially a sap sucker, and when the insects are congregated on any plant in sufficient numbers the leaves possess a tracery of white blotches, each the spot where the leaf has been pierced during feeding. In severe cases the leaves curl up and die. In special circumstances the direct losses in this way may be considerable, but it should be further noted that pests of this type are often associated with diseases of the virus order known as serious pests of cultivated crops. Tobacco suffers from some of these—e.g., mosaic—and the insect under notice may ultimately be of importance as a vector in the transmission of diseases of this type.

Spraying with Bordeaux mixture is said to render plants toxic to insects of this class, while in some quarters claims have been made that sulphur dusts are of value in its control. Both claims are being investigated, and are merely cited here as probable measures to be adopted should the pest require special attention.

Thrips.

These minute delicately winged insects sometimes increase to prodigious numbers, and cause severe losses to tobacco growers. In the Southern States certain species of thrips cause some anxiety at times, for the life cycles of the insects implicated are brief, a circumstance which makes possible a rapid increase in numbers when climatic conditions are favourable to their development. The species associated with tobacco are one-twelfth of an inch long, pale yellow in colour, and when present on the plant may be located in company with the larvæ on the under surfaces of the leaves. All stages feed by a rasping and sucking action, for which the mouth parts are specially adapted, and the combined effect of large numbers feeding on the leaves may ultimately destroy the whole plant. It is probable that this insect will become of greater importance as the cultivation of tobacco extends.

Thrips respond readily to treatment with contact sprays, among which nicotine sulphate, marketed as Black Leaf 40, is perhaps the most useful. A single thorough application will destroy most of the insects on the plant, but it is always desirable to repeat the treatment after a week has elapsed. Larvæ, which hatch from the eggs laid in the tissue of the leaves, may then be accounted for.

SUMMARY OF CONTROL RECOMMENDATIONS.

The foregoing survey of the pests which the farmer may encounter in growing tobacco suggests the primary importance of an early diagnosis when insect pests warrant attention. Suitable control measures can then be applied before the injury becomes a measurable quantity. Frequently the farmer, hemmed in by the pressure of other work, finds his attention drawn to the pests when the damage is quite appreciable. Too often the entomologist or instructor in agriculture finds himself called in to advise ways and means of coping with a pest, when all he can do is to conduct a post-mortem which points the moral for the grower concerned. It is, therefore, preferable for the farmer to regard certain fundamental operations as part and parcel of the tasks inseparable from successful tobacco-growing.

The following summary of these should serve as a guide to the farmer and spare him much of the anxiety which may otherwise be his lot:—

(*a*) Spraying with a weak solution of lead arsenate (1 lb. of lead arsenate to 50 gallons water) should begin as soon as the plants are 2 or 3 inches high in the seed-bed. When these begin to interlock in the bed spraying with full strength lead arsenate (1½ lb. to 50 gallons water) should be alternated with dusting, using a 25 per cent. lead arsenate preparation at weekly intervals. In the event of cutworm attacks in the seed-beds, Paris green baits may be distributed through the plants.

(*b*) When transplanting, only seedlings free from injury or discolouration to the stalk should be used, the rejects being destroyed by the labourer laying out the individual plants. Paris green baits should be laid along the rows, the task being carried out by the person papering the seedlings as a protection against the sun.

(*c*) Until the plants are 2 feet in height lead arsenate should be applied in dust or spray form at fortnightly intervals, special attention being given to the buds of the plants where the leaf-eating Noctuids tend to congregate. When this stage is reached dusting or spraying with lead arsenate must cease, and the lead arsenate-pollard dry bait requisitioned. This bait may be applied to the growing point of the plant just so long as the grower considers desirable—usually to the commencement of harvesting, though if the insects still cause trouble the treatment may be continued.

A schedule of operations such as this is an insurance against the major pests of tobacco. In spite of this all must be considered as supplementary to sound agricultural practices, without which most control measures lose much of their value. Hence cultivation, adequate spacing of the plants in the seed-bed, the hardening of these before transplanting, the elimination of weed growth on both the field and headlands, constitute the basis on which the superstructure of efficient insect control rests.

All tobacco growers should consider the following as necessary parts of the farm equipment:—(*a*) Knapsack spray pump, (*b*) rotary dust gun, (*c*) plunge pump dust gun—hand model. A number of suitable models are on the market, all leading distributors holding stocks worth examination.

The following insecticides ought always to be available on the farm:—

(*a*) Lead arsenate—pure powder; also 25 per cent. dust.

(*b*) Paris green.

(*c*) Black Leaf 40.

None of these deteriorate in storage, hence no time is wasted in procuring supplies when they are urgently required.

For the convenience of growers some of the metropolitan distributors from whom insecticides and the associated apparatus can be procured are listed below:—

(*a*) A.C.F. and Shirleys Fertilizers, Limited, Little Roma street, Brisbane.

(*b*) Buzacotts (Queensland), Limited, Adelaide street, Brisbane.

(*c*) Southern Queensland Fruitgrowers' Association, Limited, Cleveland, near Brisbane.

(*d*) Taylors and Elliotts, Limited, Charlotte street, Brisbane.

TOBACCO DISEASES.

By L. F. MANDELSON, B.Sc.Agr., Assistant Plant Pathologist, Department of Agriculture and Stock.

THE following notes constitute a brief review of what is at present known of the diseases with which a grower may have to contend in the cultivation of tobacco. Some of these diseases are already known to occur in Australia, others are not. The object of this account is to describe the symptoms of these diseases, and to suggest methods for their control.

The following factors are involved in the control of tobacco diseases:—(1) Seed-bed sanitation; (2) use of resistant varieties; (3) rotation of crops; (4) judicious application of fertilizers; (5) efficient cultivation and drainage; (6) eradication; (7) exclusion.

SEED-BED SANITATION.

Too much stress cannot be laid on the importance of seed-bed sanitation. The majority of tobacco diseases are either characteristic seed-bed troubles—e.g., blue mould and damping-off—or are mainly contracted in the seed-bed in the first place—e.g., mosaic and bacterial leaf spots. Usually very little can be suggested to control tobacco diseases once the seedlings have been planted in the field. Prior to transplanting, however, a considerable measure of control can be effected, since (*a*) the seed may be efficiently sterilised or obtained from a disease-free source, (*b*) a relatively small amount of soil is involved and may be similarly treated, and (*c*) a large number of plants are congregated into a small area, and hence may be carefully observed and efficiently treated should diseases occur.

Seed-bed sanitation methods may be conveniently summarised thus:—

(1) Tobacco refuse from previous crops should be carefully destroyed before the commencement of the season, and should not be used for fertilizing seed-beds.

(2) Seed should be obtained only from healthy plants whose past history is known and should be suitably surface sterilised (see discussion of blue mould).

(3) Seed-bed soil should be virgin soil or suitably sterilised (see mosaic disease).

(4) Seed-bed covers and all equipment should be new or sterilised at the commencement of the season (see mosaic).

(5) Seed-beds should be situated well away from possible sources of contamination, such as weedy areas, curing barns, or seed-beds or fields of the previous season.

(6) Seed should not be sown too thickly or overwatered (see damping-off).

(7) Care should be taken that beds do not become accidentally contaminated during the season.

(8) Should diseases occur, affected plants and those in their vicinity should be eradicated at the earliest possible moment (see blue mould). Should infection be at all general it is safest to procure healthy plants from some other source.

(9) Diseased plants should never be planted in the field.

(10) Special care should be taken after handling infectious diseases (see mosaic disease).

These measures should form part of the regular routine of growing tobacco seedlings.

RESISTANT VARIETIES.

The greatest hope of controlling diseases in the field lies in the production and use of resistant varieties. Such measures, as yet, have not been successful with many diseases, although remarkable results have been achieved in some directions—e.g., with black root rot.

ROTATION OF CROPS.

With soil-borne diseases, for which resistant varieties are not available, rotation of crops is the best expedient. Such rotation is particularly applicable in the case of wilt diseases.

JUDICIOUS APPLICATION OF FERTILIZERS.

The judicious application of fertilizers is usually desirable in normal farming practice, but where plants show definite disease symptoms through malnutrition, the appropriate application of fertilizers is an obvious necessity.

EFFICIENT CULTIVATION AND DRAINAGE.

Similarly efficient cultivation and drainage are always important factors in successful farming, but with diseases especially favoured by poor aeration and water-logging, such as mosaic and brown root rot, the importance of these factors is materially enhanced.

ERADICATION.

It should be borne in mind that disease control depends almost entirely on methods of prevention. Diseased plants, with the possible exception of those suffering from malnutrition, can practically never be cured. Consequently when only a few plants become diseased eradication in the early stages is the wisest course.

EXCLUSION.

Tobacco diseases are yearly extracting an ever-increasing toll in the older tobacco areas of the world. Hence, in Australia, where many serious diseases are not yet present and where new areas are being opened up, it is essential that every effort be made for the control of the diseases that are present and for the exclusion of those that have not yet reached this country.

Specimens of new diseases should be forwarded as soon as possible to the Department of Agriculture and Stock in order that their diagnosis might be attempted, and that suitable control measures be suggested.

BLUE MOULD.

Blue mould is the most serious tobacco disease in Australia and has been known here for many years. Diseased tobacco leaves from Queensland were diagnosed as being affected with blue mould as early as 1887. In 1891, Cobb, in New South Wales, stated that blue mould

PLATE 50.—BLUE MOULD (*Peronospora* sp.).
Showing the fructification of the fungus on the under surface of an affected leaf.

PLATE 51.—BLUE MOULD (*Peronospora* sp.).
Showing brown areas caused by the disease on a mature leaf and the final ragged appearance.

was "threatening the tobacco industry with extinction." Since then it has been reported from various parts of the Commonwealth. Isolated outbreaks of the disease have also been reported from the United States and South Africa.

Symptoms.

Blue mould is a disease which affects both seedlings and plants in the field. It is in the seed-bed, however, that it manifests itself as a serious menace. Seedlings with four to eight leaves are most frequently attacked, although infection may occur when the plant has only two leaves. The lower surfaces of leaves of affected plants are covered with a white to purplish fluff (Plate 50), which consists of the spores and vegetative parts of the mildew fungus which causes the disease. The leaf tissue breaks down, turns brown, and this is rapidly followed by the death of the seedling. The most alarming aspect of the disease is the rapidity with which it may spread under favourable conditions.

Plants may become affected in the field. In such cases patches of purplish fluff are to be observed on the under side of leaves. A brown irregular patch of dead tissue eventually develops on such areas (Plate 51), and other external manifestations of the fungus disappear. Plants so affected are not killed, but the quality of the leaf is impaired.

Cause.

Blue mould is caused by the fungus *Peronospora* sp. (possibly *P. hyoscyami*). This fungus is one of the downy mildews, some of which cause serious damage to several economic plants.

Hosts.

Blue mould has also been reported as parasitic on the native tobacco *Nicotiana suaveolens*, and on another plant of the same genus.

Overwintering and Methods of Dissemination.

Blue mould may survive from season to season on seed from diseased plants, on overwintering tobacco plants, and on weed hosts. The purplish fluff to be observed with the naked eye on the lower sides of affected leaves consists of fungous threads which in shape resemble spreading trees, with oval and practically colourless spores attached. These spores are produced in millions and are so light that they are readily blown about in the air. They may be carried to healthy plants by wind, water, or animals. The disease may readily be transferred from place to place by workmen. It was recently demonstrated that spores of blue mould were carried by the tobacco leaf miner (*Phthorimæa operculella* Zell.), and that healthy plants could be infected in this fashion. Probably many other insects can similarly transfer spores.

Conditions Favouring the Disease.

The development of blue mould is influenced to a remarkable extent by the prevailing weather conditions. Initial infection—i.e., apparently from special resting spores of the fungus on seeds and old tobacco debris—has in the past been associated with sudden periods of cold weather, especially at night, when the seedlings are at a susceptible age. Secondary infection—i.e., by the colourless spores produced on affected leaves—is apparently most favoured by dull, moist, and humid weather.

Control.

1. Use only seed which has been obtained from a healthy crop. It has been recently demonstrated that the disease is carried over in seed from diseased plants, whereas seed from healthy plants will produce seedlings free from the disease.

2. The seed treatments described by Mr. Pollock under that head are the usual recommendations for the surface sterilisation of seed. Recent research, however, by H. R. Angell has indicated that the following method is effective for seed sterilisation for the control of blue mould. The seed should be surface sterilised by enclosing it in a bag of muslin or some such material and immersing it in absolute alcohol for three to five minutes, care being taken that the seed is freed from air bubbles. After sterilisation the seed should be dried on clean blotting paper.

3. Do not overwater young seedlings. Make adequate provision for plenty of air and sunlight.

4. Destroy all volunteer or overwintering tobacco plants and weeds which may be native hosts, since such plants may harbour the disease and initiate an outbreak in the seed-bed.

5. Control as far as possible all insects in the seed-bed, since they may be capable of introducing the disease.

6. Transplant at the earliest opportunity.

7. Should the disease makes its appearance in the seed-bed, diseased plants and those in their vicinity should be immediately destroyed by applying a solution of 1 part formalin to 25 parts of water, and the bed then ventilated to prevent the rest of the seedlings being injured by the fumes.

8. If practical only plant out seedlings from beds which have not developed the disease.

MOSAIC DISEASE.

Mosaic disease of tobacco is extremely widespread, is probably the commonest tobacco disease, and occurs to some extent wherever tobacco is grown. In some cases although not usually, it may cause serious losses in yield as well as in quality. Carefully controlled experiments in the United States have shown that the yield may be reduced by as much as 50 per cent., and the gross value per acre by 75 per cent. in one year by this disease.

Symptoms.

As the name suggests the most characteristic symptom of this disease is a mottling which occurs on the leaves. Dark green and yellowish areas appear scattered irregularly over the leaf surfaces, and during the early stages of the disease are most noticeable on the youngest leaves.

When more severely affected, spots and blisters may appear and the leaves may be distorted. Plants affected with mosaic are often severely dwarfed, especially if they become affected early in the season.

The ultimate yield is, of course, directly affected by dwarfing, and the quality is affected by the production of abnormal leaves. Leaves showing the typical mosaic pattern are usually somewhat discoloured after curing, although this discolouration is not so marked nor is it of the same pattern as in the green leaf. Spots and blisters persist after curing and very adversely affect the quality of the leaf.

Cause.

Tobacco mosaic is extremely infectious, and healthy plants readily become affected with the disease if contaminated with the sap of diseased plants. It would appear, therefore, that some parasite is the cause, but, so far, probably due to its minuteness, no causal organism has been definitely demonstrated. Diseases of this nature are termed virus diseases. They are by no means uncommon and often cause considerable damage. Examples of such diseases are spotted wilt of tomatoes, bunchy top of bananas, and sugar-cane mosaic.

Hosts.

Tobacco mosaic can be transmitted to many plants, especially to those of the family Solanaceæ, such as tomato and potato. Many other plants are affected with a mosaic which is closely related to, if not identical with, tobacco mosaic.

Overwintering and Methods of Dissemination.

The virus causing mosaic may persist from season to season in crops and weeds susceptible to this disease. It may also survive for a year or more on infected material such as tobacco refuse, seed-bed equipment, and in the soil. In this connection it has been suggested that the greater prevalence of mosaic in Maryland, as compared with other tobacco-growing States in the United States, is probably due to the fact that there the previous year's crop is usually on the farm while the new crop is growing. Under such conditions seedlings and plants are handled by farm workers whose hands have probably become contaminated while working with the previous season's tobacco.

It is important to realise that practically all tobacco mosaic originates in the seed-bed. Usually only a few plants will be observed to be affected, and these only slightly. The disease, however, is readily transmitted to other seedlings by handling during the process of pulling, transplanting, replanting, &c. It has been demonstrated also that insects may spread the disease. The most serious damage from mosaic occurs when infection takes place at transplanting time or during the ensuing month.

In the field the disease may be spread by the usual cultural operations. The process of topping may be responsible for further dissemination. At this late period, yield is not significantly reduced although the quality of the leaf may be.

Conditions Favouring the Disease.

Mosaic develops best at relatively high temperatures (80 to 85 deg. Fahr.), but at still higher temperatures its development is retarded, and leaves tend to recover when the temperature exceeds 100 deg. Fahr. Rainfall and humidity do not apparently directly affect the spread of the disease. The survival of the virus in the soil is favoured by dry compact or waterlogged soils. Moist and well aerated soils tend to inactivate the virus.

Insects may transmit mosaic, and conditions affecting their occurrence may also affect the prevalence of the disease.

Mosaic is most noticeable and occurs earliest on rapidly growing plants.

Control.

Since it is not possible to control this disease in the field, efforts must be directed towards its elimination from the seed-bed.

1. All infected material should be destroyed in the seed-bed by soil sterilisation. This may be effected by burning brushwood over the bed. Sufficient heat should be generated by this method to cook a 4-oz. potato buried at a depth of 3 inches or an egg buried at a depth of 5 inches. After sterilisation all rubbish is raked off the bed, leaving the wood ashes, which should be worked into the soil.

2. All solanaceous weeds should be destroyed as soon as observed, especially in the vicinity of seed beds.

3. At the commencement of the season all seed-bed equipment should be suitably sterilised. For this purpose it should be painted or sprinkled with a disinfectant such as formalin (1 to 80 parts of water), corrosive sublimate solution (1 to 1,000 of water), or bluestone solution (1 lb. to 10 gallons of water). Cloth covers should be boiled for at least an hour.

4. Precautions should be taken against the introduction to the seed-bed of any trash from a previous crop.

5. After handling any old tobacco the hands should be thoroughly washed in soap and water prior to handling seedlings.

6. Should the disease be serious in the field and persist, notwithstanding the above precautions, then a rotation of crops, in which tobacco and other susceptible plants are not grown for a year or more, should be practised.

7. The beds should be carefully examined for mosaic plants prior to planting out, and if the disease is observed and seedlings from entirely healthy seed-beds are available, then it is best not to make use of any plants from beds showing the disease. If plants from a diseased bed must be used, then only pull those well removed from plants showing the disease. Be careful not to contaminate one's hands by handling diseased plants.

8. Should the disease show up in the field early in the season on a large percentage of the plants, it is usually advisable to replant.

BLACK ROOT ROT.

The parasite which causes this disease occurs in practically every tobacco district in the world, and consequently black root rot, from the economic view point, is probably the most important tobacco disease. It was first recorded by the writer in New South Wales in 1927, although probably the soil had been infested for many years previously, and was responsible for severe losses on that occasion. Plants are affected both in the seed-bed and in the field.

Symptoms.

In the seed-beds the roots of affected seedlings are rotted, and such plants show little vigour, and may eventually wilt and die.

This disease is rather difficult to definitely diagnose in the field, since the only symptoms to be readily observed are a general stunting,

usually accompanied by a yellowish appearance and commonly premature budding. Similar symptoms may result from unfavourable soil or moisture conditions, or from attack by parasites such as eelworms. Usually some plants are dwarfed more than others, due to the individual resistance of some plants or to variations in the amount of inoculum present. This unevenness is not to be expected when stunting is caused by unfavourable soil conditions or drought, and hence is often an indication of a root disease. A rapid recovery after warm weather is another characteristic.

On removing an affected plant from the soil it will be seen that it is darker than usual, and parts of the stem below soil level and the roots may be black. In mild cases the fibrous roots may be depleted, and when more severely affected the greater part of the root system may be rotted away. This destruction of portion of the root system and injury of the remainder results in starvation of the growing parts. Consequently the plant becomes stunted.

Plants may be only slightly stunted, or the entire crop may be rendered worthless by this disease, and since its above-ground symptoms are so inconspicuous its presence may be often overlooked.

Cause.

Black root rot is attributed to the fungus *Thielavia basicola* Zopf., although *Thielaviopsis basicola* (Berk.) Ferraris, which is usually associated with it, may be the actual cause of the trouble.

This organism has been known for many years in Europe and America, and was first reported as a parasite of tobacco in 1897.

Host Plants.

The organism is known to attack over a hundred species of plants, although on many of them it only functions as a weak parasite. Amongst its hosts are peanuts, beans, peas, red clover, lucerne, alsike clover, cotton, and watermelon.

Overwintering and Methods of Dissemination.

This fungus may survive in the soil for several years. In the presence of its host plants soil infestation will gradually increase. It is introduced to clean areas through the transference of contaminated soil and of diseased plants. Soil, together with the causal organism, is usually introduced by running water, farm implements, farm workers, &c.

Conditions Favouring the Disease.

The most important factors influencing infection are soil infestation and soil temperature.

The severity of the disease is remarkably controlled by soil temperatures, apparently because at high temperatures susceptible plants, by the production of corky tissue, can ward off the invading parasite. For this reason affected plants may suddenly recover during warm weather. The disease is most serious at temperatures between 63 and 73 deg. Fahr. At 84 deg. Fahr. little actual damage results and at 90 deg. Fahr. no infection occurs. During warm seasons growth may not be retarded although the soil is heavily infested.

Control.

1. Soil for the seed-bed should be sterilised as indicated in the measures discussed for the control of mosaic disease.

2. Diseased seedlings should not be transplanted.

3. Heavily infested soil should not be used for growing tobacco or other highly susceptible plants more than once in four to eight years.

4. The most promising method of control lies in the use of resistant varieties. Excellent work has recently been carried out in America in the production of varieties of tobacco highly resistant to this disease.

5. Some degree of improvement may be affected by growers selecting their own seed only from the most vigorous plants in the field.

BLACK-SHANK.

This is a serious disease of Sumatra and Java and of some sections of the Southern States of America. It has not yet been recorded from Australia. It affects plants both in the seed-bed and in the field. Losses are frequently very severe.

Symptoms.

In the seed-beds a rot occurs similar to damping-off. In the field it causes a serious wilt rather similar to bacterial wilt, and also a rot of the stem which may extend from ground level to 24 inches above the soil. The pith and roots may also become involved. On the leaves large brown blotches are produced, especially after rain.

Cause.

The disease is caused by the fungus *Phytophthora nicotianae*. Fungi of this genus are associated with several serious diseases of cultivated plants—e.g., Irish blight of potatoes and tomatoes, citrus fruit and root rots and top rot of pineapples.

Methods of Overwintering and Dissemination.

The spores of this fungus may survive in the soil for at least two years. The disease may be transferred to new areas by the introduction of contaminated soil, which may be effected by the usual methods of soil transference—e.g., by running water, implements, apparatus, and farm workers. As with related fungi the spores may possibly be carried through the air in various ways.

Conditions Favouring the Disease.

Wet weather favours the development of the disease. In view of its geographical distribution it is also probably favoured by high temperatures.

Control.

1. Soil for the seed-bed should be sterilised in the manner discussed in the diseases already dealt with, or at least be free from possible contamination.

2. Diseased or doubtful plants should not be transplanted.

3. Care should be taken not to transfer soil from infested to clean areas.

4. Varieties differ greatly in susceptibility, and resistant types may ultimately be evolved. The use of such varieties could then be recommended.

DAMPING-OFF.

Damping-off diseases are those which cause a rot of seedlings in the stem near the surface of the soil. These diseases are not confined to tobacco, but attack many kinds of plants grown in seed-beds. They may attack seedlings at any stage of growth in the bed.

Symptoms.

Under favourable conditions these diseases cause the tissue of the stems to collapse near ground level, with the result that affected seedlings tend to topple over, lie flat on the soil, and the leaves and stems decay. In some cases only a dark sunken area is to be observed on the lower portions of the stems of affected plants.

Cause.

There are several causes of damping-off. The most usual causes are either of two fungi, *Rhizoctonia solani* (*Corticium vagum*), and *Pythium debaryanum.* They produce the same symptoms on affected plants although the organisms themselves are quite distinct. They attack a great variety of plants and occur as common soil-inhabiting organisms where their host plants have grown.

Overwintering and Methods of Dissemination.

These organisms may persist for a considerable time in the soil. The disease is not readily disseminated by spores being carried in the air, but an area of infection usually spreads from plant to plant through the soil from a centre of infection. Clean land may become contaminated by soil from an infested area being transferred to it.

Conditions Favouring the Disease.

This disease may be responsible for considerable damage under favourable conditions, and many of these conditions may be controlled by the grower.

It is favoured by excessive humidity for relatively long periods, poor ventilation at the surface of the soil, and by overcrowded seed-beds. High humidity may result from the prevailing weather conditions or from poor ventilation.

Control.

1. Soil for seed-beds should be well sterilised by the application of direct heat, as previously discussed, and care should be taken that they do not become reinfested with unsterilised soil, old tobacco trash, or animal manures being accidentally transferred to them.

2. Seed-bed soil should preferably consist of well-drained, sandy soil.

3. Do not plant too thickly.

4. Avoid watering beds too frequently since moisture on the surface of the soil encourages the development of the disease.

5. As a preventive measure plants may be watered with a solution of mercuric chloride at the rate of 1 oz. of mercuric chloride to 10 gallons of water one week after the plants emerge, and at weekly intervals afterwards.

6. Provide as much ventilation as is practicable.

7. Should the disease occur in small, isolated areas remove the infected plants and those in their vicinity. If the plants are still young apply a solution of 1 part formalin to 25 parts of water to the infested area, and ventilate to permit the escape of the gas. Dry the bed well off if possible.

8. Plants with damping-off lesions on the stem should not be planted out.

STEM ROT.

Invasion by various fungi may result in a stem rot condition. Plants which have recovered from damping-off in the seed-bed and have been planted out frequently develop this condition. In other cases infection probably occurs in the field.

Symptoms.

A rot usually develops on the stem near the surface of the soil (Plate 52). This rot is dark brown or black in colour, although it may be covered by the plant epidermis or outer skin, and then have a general light-brown appearance. Under favourable conditions the rot may affect the lower leaves. Diseased plants are usually stunted and yellowish since the injury to the stem interferes with their normal nutrition.

Cause.

Various organisms may bring about this condition. *Rhizoctonia solani, Pythium debaryanum* (typical damping-off fungi) *Sclerotium rolfsii,* and undescribed bacteria have been found responsible for this disease.

Conditions Favouring the Disease.

In most cases the plants are diseased when transplanted. Should the soil remain wet for a considerable time the causal organism is stimulated to activity, and consequently extensive decay may result.

Control.

1. Control measures as recommended for damping-off will eliminate initial infection.

2. Diseased plants should not be planted out.

3. Wet, poorly drained land should be avoided.

4. Should the disease frequently occur in the field a rotation of crops should be practised.

BACTERIAL LEAF SPOTS.

Three leaf-spotting diseases which are caused by bacteria are known to occur in the United States. They are wild-fire (*Bacterium tabacum*), black-fire (*B. angulatum*) and the Wisconsin leaf spot (*B. melleum*). Wild-fire is a relatively new disease which only made its appearance in 1917, but has since been introduced into practically all the American tobacco-growing districts. Black-fire or angular leaf spot is more or less confined to the Southern States. Wisconsin leaf spot is rarely as serious as the other two diseases and is apparently confined to the State of Wisconsin. None of these diseases have as yet been recorded from Australia. Serious losses may be caused by these diseases as is indicated by the fact that in Virginia in 1920 the loss due to black-fire alone was estimated as exceeding £1,000,000.

These bacterial diseases, like mosaic, originate in the seed-bed.

Plate 52.—Stem Rot (*Sclerotium rolfsii*).

Symptoms.

Wild-fire spots are usually circular, of a bleached or yellowish colour, and vary considerably in size. In the centre of each spot is a dried area which may vary from a pin point to half an inch in diameter. The surrounding pale area may consequently be considerable or be narrow or even entirely lacking. Spots of this description may be distinct or may coalesce. Affected plants fail to make satisfactory growth, and diseased leaves tend to dry up, break, and have a general ragged appearance.

In the case of black-fire the spots are small and angular on thin leaves, but more rounded on thick leaves, and black or dark brown in colour. They have a clear border, but not the conspicuous halo which is usually associated with wild-fire spots.

With Wisconsin leaf spot in the seed-bed small angular spots occur very similar to those of black-fire. On older plants the symptoms resemble wild-fire except that the halo is usually much narrower than that of the typical wild-fire spot.

Overwintering and Methods of Dissemination.

Bacterial leaf spots contain enormous numbers of pathogenic bacteria. They may be readily carried from plant to plant by wind, rain, farm workers, or on farm implements. These organisms are able to enter healthy tobacco leaves, especially through wounds, and there multiply and establish themselves and so give rise to a leaf spot. The disease most rapidly spreads during periods of driving rain, since under these conditions the bacteria are not only carried to neighbouring leaves, but these leaves are often damaged at the time, and the moisture present is another factor favouring infection.

It is not definitely known just how these organisms survive from season to season. The most likely manner of primary infection is from the previous season's diseased tobacco trash, whence the infection is accidentally carried to the seed-beds. The materials and equipment used in the seed-bed should also be regarded with suspicion as possible carriers of the disease.

Control.

The infectious nature and possibly the methods of overwintering of these diseases are similar to those of mosaic. Consequently the suggestions for seed-bed sanitation and elimination under that head apply equally well in this case. As an additional precaution seed should be suitably sterilised.

Should only a few isolated plants develop these diseases early in the season, it would be advisable to remove and destroy them in order to avoid their further spread.

FUSARIUM WILT.

Fusarium wilts are serious diseases of many cultivated plants, and their symptoms are very similar. The species of *Fusarium*, however, attacking tobacco does not, so far as is definitely known, affect other plants. In common with other soil-borne diseases it is very difficult to control.

Symptoms.

Infection probably occurs shortly after transplanting, but apparently depending on prevailing weather conditions symptoms may not be observed until affected plants are approaching maturity.

The disease causes a typical wilt which may be localised to one side of the plant or leaf. The leaves wilt, become yellowish, and dry up. Eventually the entire plant may die. The disease may be detected in the early stages by cutting across the stem with a knife. It will be observed with affected plants that the water-conducting vessels or woody portions are dark or yellowish in colour instead of white as in healthy plants.

Cause.

This disease is caused by the parasitic fungus *Fusarium oxysporum* var. *nicotianæ.* It establishes itself in the water-conducting vessels of the plant, and by mechanical blockage and by the secretion of toxic substances causes the plant to wilt.

Overwintering and Methods of Dissemination.

The organism may survive in the soil for at least three years, and so far as is known gains access to the tobacco plant through wounds in the roots or the lower portion of the stem. It is spread by the usual methods by which infested soil is transferred—e.g., by water, farm implements, and workmen.

Conditions Favouring the Disease.

Fusarium wilt thrives at relatively high temperatures, and hence its geographical distribution and virulence is limited thereby. It has been observed to be most aggressive at temperatures between 82 deg. and 88 deg. Fahr. It is most common in seasons when the soil temperature remains as high as 80 to 90 deg. Fahr. for some time. Eelworms, wireworms, and other factors which cause root injury favour infection. Factors influencing the severity of the disease are the amount of infestation in soil, the amount of wounding, temperature, and rainfall.

Control.

1. Do not grow tobacco on infested soil for at least three years if the disease becomes serious.

2. Use the most resistant varieties which may become available.

3. Avoid transferring the disease to healthy areas by way of diseased plants when transplanting, or by infested soil.

4. Avoid seed-bed infection by having such beds well away from possible sources of contamination and by soil sterilisation.

BACTERIAL WILT.

The characteristics of this disease are very similar to those of Fusarium wilt, and it also thrives best in warm weather.

Symptoms.

Usually symptoms are first observed two to four weeks after transplanting. Leaves droop in a characteristic umbrella-like fashion, become distorted, yellow, and finally dry up. Later the stem darkens and the plant dies. On cutting across the stem the woody portion is dark or black. When the cut end is pressed a dirty white ooze appears, which is characteristic, and serves to distinguish it from Fusarium wilt.

Cause.

This wilt of tobacco, as well as many other plants, is caused by *Bacterium solanacearum.* The bacteria establish themselves in the woody vessels of the plant, and there by mechanical and other means interfere with the nutrition of the plant and cause a wilt.

Host Plants.

This organism also attacks tomatoes, potatoes, peanuts, egg plants, velvet beans, garden beans, and several solanaceous weeds.

Overwintering and Methods of Dissemination.

The causal organism survives in the soil and in plant refuse for at least four or five years. Usually areas become gradually infested, but should tobacco or other susceptible crops be planted each year infestation becomes general, and will persist indefinitely.

Infested soil, and hence the disease, may be transferred to healthy areas by water, equipment, workmen, animals, &c.

Conditions Favouring the Disease.

Bacterial wilt is most aggressive under warm weather conditions, and its distribution is definitely limited by this factor. Its development is most favoured by wet weather, although its symptoms are naturally most marked under droughty conditions. Sandy soils are favourable for the development of the disease, since they tend to become heavily infested with eelworms, which are capable of injuring root tissue. Practically all infection initiates through wounds.

Control.

1. Investigations so far have shown that crop rotation is the only method known which has given satisfactory control. On badly infested soil tobacco should not be grown more often than once in five years. After the disease has been brought under control tobacco may then be grown safely every fourth year. Crops resistant to this disease include cotton, maize, cereals, sweet potatoes, cowpeas, grasses, and red and crimson clover.

2. The usual methods of seed-bed sanitation should be practised.

FROG-EYE.

Frog-eye is a parasitic leaf spot which occurs in Australia and elsewhere to some extent, but it is usually not considered of any great importance.

Symptoms.

The spots occur on the leaves as roughly circular brownish spots with a pale centre upon which are small black specks, these being masses of spores of the fungus causing the diseases. (Plate 53). The leaf spot may vary considerably in size and colour, and the only definite method of diagnosis is by a microscopic examination. It is usually found on the bottom leaves, especially as the plant approaches maturity.

Cause.

This disease is caused by the parasitic fungus *Cercospora nicotianæ.* The spores are needle-shaped with cross walls, and are produced in tufts on the dark areas at the centre of the spot.

Plate 53.—Frog Eye (*Cercospora nicotianæ*).

PLATE 54.—PHYLLOSTICTA LEAF SPOT (*Phyllosticta nicotiana*).

Conditions Favouring the Disease.

The development of frog-eye is favoured by rain or heavy dew, since moisture is necessary for the germination of the fungous spores. Leaves appear to become more susceptible to the disease with age.

Control.

The sporadic nature of diseases of this type has so far not warranted the adoption of special control measures. Initial infection, however, should be reduced to a minimum by efficient methods of farm sanitation.

PHYLLOSTICTA LEAF SPOT.

The Phyllosticta leaf spot affects foliage both in the seed-bed and in the field. The spots are brown, zonate, irregularly round in outline, and usually not greater than half an inch in diameter (Plate 54). The affected area is bordered by a slight, pale margin. The centres vary from a pale brown to a dirty white. With age the centres fall out of the leaves. The disease is caused by the parasitic fungus *Phyllosticta nicotiana.*

RING SPOT.

Ring spot may occur fairly uniformly over an affected leaf. The spots are circular or very irregular in shape and are bordered by a narrow line of dead tissue. The disease has been called "hieroglyphics" in allusion to the peculiarity of these markings. It has recently been proved that the disease is infectious and it is probably caused by a virus. It apparently occurs to some extent in Australian tobacco areas.

FRENCHING OR SWORD LEAVES.

This disease is characterised by the production of abnormal leaves. They are at first yellowish, thick, and brittle, and later show a tendency to narrowness and mottling. Eventually the leaves are bunched together in large numbers. Apparently this disease is not infectious, and seems to be associated with abnormal soil conditions. Observations indicate that it often occurs on poorly aerated soils.

In the present state of knowledge little can be suggested as control measures, except that proper drainage, subsoiling, and cultivation with a well-balanced fertilizer programme may tend to obviate this trouble

BROWN ROOT ROT.

This obscure disease of tobacco has been responsible for severe losses in some districts in America.

Symptoms.

The symptoms of this disease are very similar to those of black root rot—i.e., a stunting and yellowing associated with a damaged and depleted root system. It differs, however, in that the lesions on underground parts are brown rather than black.

Cause.

No parasite has been definitely proved to be the cause of this disease. Some evidence seems to indicate that the condition is induced by an abnormal soil condition resulting from the growth of certain crops—e.g., timothy, maize, and clover, in a rotation with tobacco.

PLATE 55.—POTASH STARVATION.

Its disappearance is as remarkable as its advent, since the continuous growth of tobacco apparently results in a diminution of the disease. Consequently, in regard to this particular disease, continuous culture of tobacco on affected soils appears to be desirable.

Other Crops Affected.

Other crops, particularly the tomato, are affected by brown root rot. Potatoes and many legumes are affected to a lesser extent.

Conditions Favouring the Disease.

This disease is favoured by relatively cool weather. Warm weather followed by rain results in considerable recovery.

Sand-Drown or Magnesium Deficiency.

The leaves of affected plants become pale, and finally practically white between the veins and midrib. The trouble usually starts from the tips and margins of the basal leaves and works inwards between the veins towards the midrib.

This disease has been shown to be caused by a shortage of magnesium in the soil or in the fertilizer used.

It usually occurs on sandy soil of low natural fertility and especially in seasons of high rainfall when leaching may occur.

Control.

A relatively small amount of magnesium added to the soil will tend to rectify this trouble. Sulphate or chloride of magnesium or vegetable manures such as farmyard manure are recommended for this purpose.

POTASH STARVATION.

Insufficient potash in the soil causes a general stunting of the plant, and the leaves become crinkled and turn down at the margin. An indefinite yellowing commences around the margins of leaves and works in between the veins, and small, pale spots may appear. (Plate 55.) Leaves from plants deficient in potash are usually brittle.

Control.

This condition will not occur where suitable quantities of potash have been included in the fertilizers applied.

Should this condition be observed sufficiently early in the growing season some benefit may result from a liberal application of a readily available form of potash, e.g., sulphate of potash, between the rows of the crop.

BORON DEFICIENCY.

This is not a common disease, but is given as an example of how minute quantities of certain elements may materially affect the development of the tobacco plant.

When this element is lacking the terminal bud is injured and growth, more especially of the stalk, is markedly reduced. It has been found experimentally that normal tobacco plants may be grown when 0·5 parts of boron per million of solution are present, but that growth is abnormal when this minute quantity is absent.

The writer wishes to acknowledge his indebtedness to overseas literature, especially "Tobacco Diseases and their Control," by James Johnson, particularly in respect of diseases not occurring in Australia.

BLOW-FLY IN SHEEP.

SUGGESTED SAVING IN JETTING EQUIPMENT.

THE importance of jetting for the prevention and destruction of blow-fly maggots in sheep has been stressed in previous issues and the advice is no doubt appreciated by many woolgrowers. In these times of financial stringency many do not feel disposed to spend any large sum on plant; this often causes the adoption of less desirable means of control and, no doubt, in many instances prevention measures are not practised. The following points in practical economy are therefore suggested:—

1. A large proportion of western properties are using one or more farm pump engines.

2. Many others will require one of these as a pumping unit during the coming season.

3. The illustrations show how pumping equipment can be used as the major portion of a first-class reliable jetting plant.

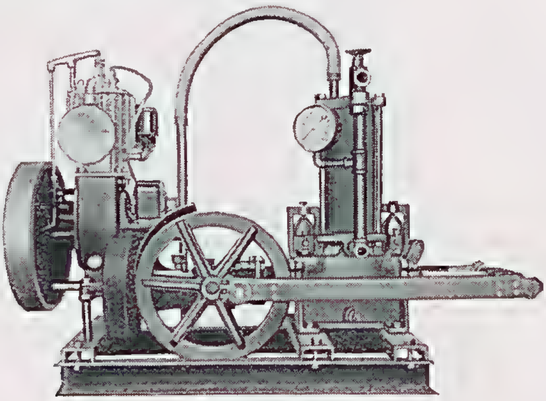


Fig. 1.

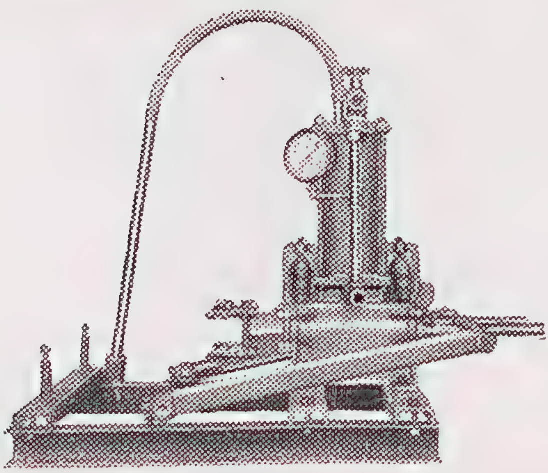


Fig. 2.

PLATE 56.

Fig. 1 illustrates a complete jetter. The suction hose is inserted into the drum or cask of jetting fluid. The outfit comprises the well-known Farm Pump engine, direct-coupled to a highly efficient double-action pump, the valves of which are easily accessible; also a removable brass cylinder lining with relief valve, enabling the pressure to be regulated at from 50 to 200 lb., and a reliable pressure gauge mounted on a channel steel base. The price is approximately £59 10s., as supplied by Buzacotts (Queensland) Limited.

Fig. 2 shows the same outfit as mounted on a channel steel base bored ready to take the Farm Pump engine. It is a matter of only a few minutes to fit it into position. The price is about £24 10s., hose and jetting pistol extra.

PIG FEEDING TEST.

Subjoined is a report on a pig-feeding trial, conducted by the Department of Agriculture and Stock, under the direction of the Minister, Hon. Harry F. Walker, at the Stock Experiment Station, Yeerongpilly.

The object of the test was to find the feeding values of barley, maize, and wheat when fed to pigs in combination with protein-rich supplements. The test commenced on 11th March, 1931, and the results now published should prove of great interest to Queensland pig-raisers.—Editor.

STOCK USED.

SIXTY-SIX pigs were used in the trial, and they were evenly divided into three lots of twenty-two each. Lot I. was fed barley. Lot II. was fed maize. Lot III. was fed wheat.

Having used this comparatively large number of animals, the average results may be taken as reliable, because the influence of individuality was largely overcome.

To suit the available accommodation and the variation in the size of the pigs, each lot was divided into five pens. (See Table I.)

Pens 1, 2, and 3 in each lot consisted of four Berkshires, while pens 4 and 5 in each lot consisted of two Berkshires and three Berkshire-Tamworth crosses. The distribution of sexes in each lot was fairly even.

The quality of the pigs used was fairly good. In type the crossbreds were good, while the Berkshires were rather short and thick and heavy in the foreparts of the body.

Each pig was given a worm capsule a few days prior to the commencement of the test. The pigs were accustomed to their food for several days before the test started.

Each pig was given a numbered eartag for identification purposes, and was weighed individually for three consecutive days, the average of these three weights being taken as the commencing weight on the second day, 11th March, 1931.

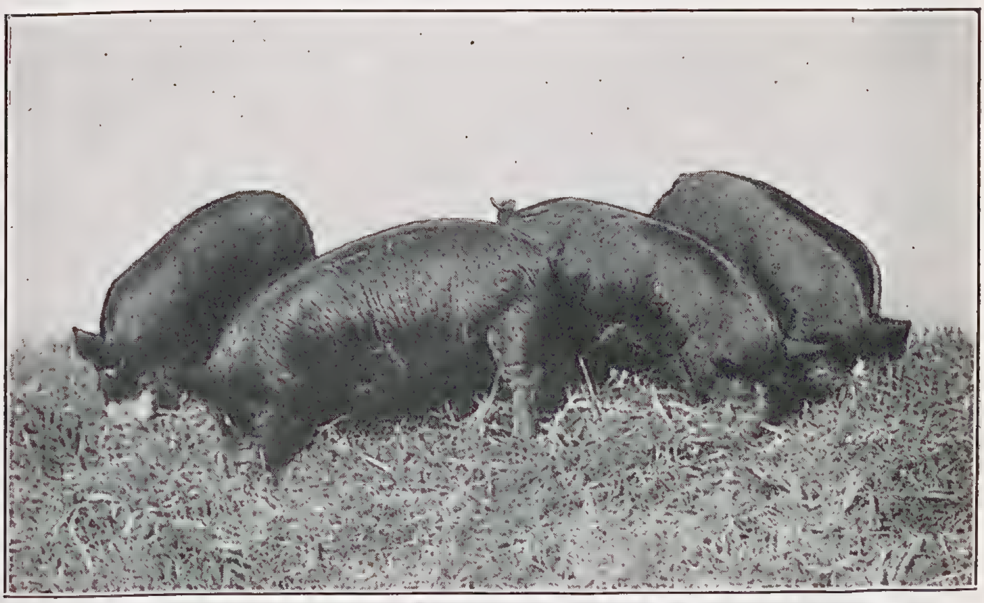


Plate 57.—Pen No. 3 of the Wheat-Fed Lot on 23rd April, 1931.

TABLE I.

(Lot I.)

Particulars.	Pen 1.	Pen 2.	Pen 3.	Pen 4.	Pen 5.
Number of pigs	4	4	4	5	4*
Average commencing weight in pounds	27·75	32·25	41·50	60·60	79·00
Number of days fed ..	103	103	89	55	48
Average final weight in pounds	130·00	140·25	141·75	132·40	148·75
Average gain per pig in pounds	102.25	107.75	100·25	71·80	69·75
Average daily gain per pig in pounds	·99	1·04	1·12	1·30	1·45

(Lot II.)

Particulars.	Pen 1.	Pen 2.	Pen 3.	Pen 4.	Pen 5.
Number of pigs	4	4	4	5	5
Average commencing weight in pounds	28·75	33·00	40·00	58·00	81·40
Number of days fed ..	103	103	89	55	48
Average final weight in pounds	143·0	150·50	137·50	146·20	166·20
Average gain per pig in pounds	114·25	117·5	97·50	88·20	84·80
Average daily gain per pig in pounds	1·12	1·14	1·09	1·60	1·76

(Lot III.)

Particulars.	Pen 1.	Pen 2.	Pen 3.	Pen 4.	Pen 5.
Number of pigs	4	4	4	4*	5
Average commencing weight in pounds	27·50	33·50	40·25	58·75	80·40
Number of days fed ..	103	103	89	55	48
Average final weight in pounds	131·75	145·25	141·25	147·25	156·20
Average gain per pig in pounds	104·25	111·75	101·00	88·50	75·80
Average daily gain per pig in pounds	1·01	1·08	1·13	1·60	1·57

* One pig in each of these pens developed sickness and was withdrawn from the trial soon after its commencement; their records have been eliminated from the results.

Accommodation.

Through the lack of more suitable accommodation the pigs were confined to small pens with an average area of 150 square feet, and had no grazing. The floors were partly concrete and partly earth. A section of the concrete was covered with a wooden sleeping platform. The pens were half covered in and half open.

Feeding.

As the object of the trial was to test the feeding value of barley, maize, and wheat, nothing was included in the ration as a substitute to these feeds, but just sufficient protein-rich foods were added to make (for practical purposes) balanced, complete, and palatable rations. The two protein-rich foods used were separated milk and lucerne, which was used both as chaff and as green fodder. These two foods were chosen as being commonly available on Queensland farms.

Particulars of Feeds Used.

BUSHEL WEIGHTS OF GRAINS.

Barley (malting)	53.38 lb.	(Above standard.)
Maize	53.40 lb.	(Below standard.)
Wheat	55.90 lb.	(Below standard.)

CHEMICAL ANALYSES OF GRAINS AND SEPARATED MILK.

Name.	Water.	Ash.	Protein.	Fat.	Fibre.	Carbo-hydrates.	Lime.	Phos-phoric Acid.
	%	%	%	%	%	%	%	%
Separated milk	91·5	0·703	3·60	0·04	..	4·76 (Lactose)	0·140	0·196
Wheat meal	11·2	1·5	11·1	1·3	2·5	72·4	0·056	0·554
Maize meal	10·9	1·4	9·8	4·0	2·6	71·3	0·018	0·535
Barley meal	11·1	2·6	8·6	1·8	4·9	71·0	0·059	0·709

The lucerne chaff used was good quality, leafy chaff, mostly bright, but sometimes it had gone brown before being fed.

PLATE 58.—PEN NO. 3 OF THE BARLEY-FED LOT ON 23RD APRIL, 1931.

The mineral mixture was a proprietary line containing several common ingredients; its use was looked upon as an insurance against mineral deficiency, and, as less than half an ounce was fed daily per pig, its cost was very slight (less than 1½d. per month per pig).

All foods were of good quality. The meals were all ground to the one size, which was a little coarser than pollard. The meal, chaff, minerals, milk, and a little water were mixed together to make a wet mash, and this mash was allowed to soak from one feeding time to the next. The mash was weighed out and then thinned with water immediately prior to feeding, hot water being used on cold mornings. Only sufficient water was added to make the mash into a very thick slop. The pigs were fed twice daily—at 8 a.m. and 4 p.m.—with two even feeds. The green fodder was given at midday. In between feeds the troughs were kept supplied with water.

In order to feed the three grains on an equal basis, we have assumed that comparative feeding values are the same when the three are ground, and soaked as if they were fed whole, crushed dry, or steamed. If, for example, maize is just as efficient whole as it is ground, and barley is as efficient as maize only when ground, then the cost of grinding must be debited to barley; this and other questions, however, could not be incorporated in this trial, but could well be made the subject of investigation in other trials.

The green fodder consisted mainly of lucerne, which was mostly young and succulent, but at times rather old and fibrous; also a fair amount of grasses were mixed with the lucerne, and for a time green sorghum was substituted for lucerne.

The pigs were weighed weekly, and their rate of growth was taken as an indication of their food requirements.

Table II. shows the average daily food consumption per pig of each lot and the amounts of foods required to produce 1 lb. increase in the weight of the pigs.

TABLE II.

SHOWING THE COMPARATIVE GROWTH AND FOOD CONSUMPTION OF LOTS I., II., AND III.

Particulars.	Lot I. (Barley).	Lot II. (Maize).	Lot III. (Wheat).
Number of pigs	21	22	21
Total commencing weight in pounds	1,026	1,104	1,042
Average commencing weight in pounds	48·85	50·18	49·61
Average number of days fed	79	79	79
Total finishing weight in pounds	2,905	3,286	3,043
Average finishing weight in pounds	138·33	149·30	144·9
Total gain	1,879	2,182	2,001
Average gain per pig	89·47	99·18	95·28
Average daily gain per pig	1·13	1·25	1·20
Average Daily Feed per Pig—			
Grain (pounds)	2·73	2·79	3·06
Lucerne chaff (pounds)	·41	·42	·36
Separated milk (pounds)	6·66	6·80	5·38
Mineral mixture (ounces)	·50	·50	·50
Green fodder (pounds)	2·05	2·06	2·09
Feed required for 100 pounds Live Weight Gain—			
Grain (pounds)	239·38	217·46	251·22
Lucerne chaff (pounds)	36·72	32·66	30·14
Separated milk (pounds)	584·40	528·87	442·17
Mineral mixture (pounds)	2·70	2·32	2·51
Green fodder (pounds)	179·80	160·31	171·31

It will be noticed that Lot III. consumed more grain but less separated milk and lucerne chaff than Lots I. and II.; this difference in the ration was made because chemical analyses of the grains showed that the wheat contained a higher proportion of protein matter than did the maize or barley, and thus required less supplementary foods in the ration.

The pigs were fed practically as much as they would clean up at each feeding time.

Weather Conditions.

The trial was commenced during the wet season, and during the longest feeding period—viz., 103 days. There were twenty-one wet days. On two days very cold westerly winds were experienced. The average 9 a.m. shade grass temperature during the 103 days was 65 deg. Fahr.

Two pigs developed sickness and were withdrawn from the trial soon after the commencement, their records having been eliminated from the results as far as possible.

Marketing.

The corresponding pens of each lot were finally weighed and marketed when the majority of pigs in each pen were of correct weight and condition for bacon.

Quality of Meat.

Each carcass was reported on by the factory grader after it had been killed.

TABLE III.

Showing Summary of Bacon Factory Reports on Carcasses.

Particulars.	Lot I.	Lot II.	Lot III.
	Per cent.	Per cent.	Per cent.
Percentage of loss from live to dressed weight ..	32·2	30·4	30·0
Percentage of carcasses graded "Choice" ..	38·0	19·0	47·0
Percentage of carcasses graded "First"	52·0	50·0	43·0
Percentage of carcasses graded "Second" (slightly overfat)	10·0	31·0 *	10·0

The average percentage of loss from live weight to dressed weight over all pigs was 30.8 per cent.

A summary of the bacon factory's grading of the pigs shows 34 per cent. choice, 48 per cent. first grade, and 18 per cent. second grade.

* It will be noticed that all lots had some over-fat carcasses, and that the percentage of over-fat carcasses was higher in the maize lot than in the wheat and barley lots. This, however, was not so much due to the maize producing more fat as it was to the fatty, quick-maturing type of pig used in the test. In every consignment of pigs slaughtered the heaviest pigs were over-fat, which indicates that the pigs might have been marketed at lower weights, and as the average finishing weights of the maize-fed pigs were heavier than those of the wheat and barley fed pigs a greater number of second-grade pigs appeared in the maize-fed lot.

It was quite evident that all the pigs could have been made over-fat had they been fed rapidly up to heavier weights. This observation reveals the necessity for larger and later maturing types of pigs for the production of fast-growing and lean bacon pigs.

No difference could be detected in the average quality with regard to firmness, texture, or colour of the meat of the three lots either before or after curing, and these qualities in the meat were commented on very favourably by the grader and the curer at the bacon factory.

Financial Aspect.

In computing the financial returns for the grains it must be understood that food is only a portion of the total cost in pork production, and other items, such as labour in caring for the pigs and interest on capital invested in stock and equipment, form a percentage of production costs, which vary on every farm, and must be computed by each farmer when he is considering his cost of pork production.

As this experiment was conducted for the purpose of testing barley, maize, and wheat as pig foods, a comparison of money values of these grains is shown in Table IV. It must be noted, however, that these comparative values will only be applicable when good quality pigs are well cared for and fed on rations similar to those used in this experiment; also, in computing the return for these grains in pork production, actual costs of caring for the pigs must be included by the farmer.

TABLE IV.

After allowing values of
£4 per ton for lucerne chaff,
$1\frac{1}{2}$d. per gallon for skim milk,
12s. 6d. per 100 lb. for mineral mixture,
15s. per ton for green fodder,
and allowing for 30 per cent. loss from live weight to dressed weight—

——	Barley per ton of 2,000 lb.			Maize per ton of 2,000 lb.			Wheat per ton of 2,000 lb.		
	£	s.	d.	£	s.	d.	£	s.	d.
Pork at $3\frac{1}{2}$d. per lb. returns	4	4	9	5	5	0	4	17	5
Pork at 4d. per lb. returns	5	9	4	6	11	10	6	5	0
Pork at $4\frac{1}{2}$d. per lb. returns	6	13	5	7	18	8	7	3	5
Pork at 5d. per lb. returns	7	17	9	9	5	6	8	6	5
Pork at $5\frac{1}{2}$d. per lb. returns	9	2	1	10	12	4	9	9	5
Pork at 6d. per lb. returns	10	6	5	11	19	2	10	12	5
Pork at $6\frac{1}{2}$d. per lb. returns	11	10	9	13	6	0	11	15	5
Pork at 7d. per lb. returns	12	15	1	14	12	10	12	18	5

Plate 59.—Pen No. 3 of the Maize-Fed Lot on 23rd April, 1931.

Conclusions.

(1) There is a slight difference in the feeding values of barley, maize, and wheat when fed in well-balanced rations to pigs from the weaner stage to baconer stage, maize being more valuable than wheat and wheat more valuable than barley.

(2) There is no apparent difference in the texture, firmness, or colour of the bacon produced from pigs fed heavily on maize, wheat, or barley when these foods are used in well-balanced rations.

(3) Well-fed pigs should increase in weight from 50 lb. to 150 lb. at the rate of over 1 lb. per day.

(4) Lucerne chaff is a very palatable food for young pigs when a small proportion is used in combination with grain and separated milk, and in this trial the lucerne had no ill-effect on the quality of the pork or bacon.

(5) An average ration of 2.3 lb. of grain, .3 lb. of lucerne chaff, 5.1 lb. of separated milk, and 1.7 lb. of greenstuff was required to produce 1 lb. live weight increase in pigs of 50 lb. to 150lb.

General Notes.

Staff Changes and Appointments.

The Officer in Charge of Police at Einasleigh has been appointed also an Inspector under the Diseases in Stock and the Brands Acts.

Removal of Cane Plants Prohibited.

The Governor in Council has approved of the issue of a Proclamation which provides that sugar-cane plants cannot be removed from the parishes of Maryborough, Tinana, Bidwell, Walliebum, and Young unless they are accompanied by a permit issued by an inspector stating that the property from which the plants are to be removed is free from the disease known as "Fiji" disease of sugar-cane.

Opossum Trapping Permits.

The Governor in Council has approved of the issue of a new regulation under the Animals and Birds Acts. This regulation provides for the issue of permits to opossum trappers by persons appointed by the Minister. During the previous three open seasons opossum boards operated in the eight districts constituted in the State, but it has now been decided that the Inspectors of Stock who previously occupied the position of chairmen of the boards should issue the required permits on this occasion.

Native Animal and Bird Sanctuaries—Kenmore and Mount Garnet.

The Governor in Council has approved of the issue of an Order in Council declaring the property of Mr. V. W. A. Moller, situated on the Kenmore-Lone Pine road, at Kenmore, to be a sanctuary under "*The Animals and Birds Acts,* 1921 *to* 1924," in which it shall be unlawful for any person to take or kill any animal or bird. Mr. V. W. A. Moller has also been appointed an Honorary Ranger under the abovementioned Acts.

An Order in Council was recently issued declaring the Oakey Creek Water Supply Dams near Mount Garnet as a sanctuary under the Animals and Birds Acts. A further Order in Council has now been approved extending this sanctuary, which now comprises the area within a radius of 3 miles from the Oakey Creek Water Supply Dams, Mount Garnet.

Metropolitan Rabbitries.

The Minister for Agriculture and Stock (Mr. H. F. Walker), accompanied by Mrs. I. Longman, M.L.A., and departmental officials, visited rabbitries in the metropolitan area recently, as it was his desire to have personal knowledge of the conditions under which Angora and Chinchilla rabbits were maintained. He was very impressed with premises known as the "Regal" Rabbitries, owned by Mrs. Edith Harris, situated on Anzac road, Belmont. These premises have been erected with due regard to the necessity for the observance of hygienic conditions, and the Angora and Chinchilla rabbits are admirably hutched.

Mr. Walker pointed out that the distribution of Chinchillas is prohibited, except to rabbitries where they have hitherto been maintained, but he laid emphasis on the necessity for prospective owners of Angora rabbits giving attention to the methods under which they are housed. He suggested that any person desirous of obtaining a personal knowledge of the most efficient method for housing these rabbits would study his interests by paying a visit to the rabbitry in question.

A Big Task.

There was a ring of sincerity in the voice of the Minister for Agriculture (Mr. H. F. Walker) when he congratulated an after-dinner speaker (at a function arranged recently by the Poultry Farmers' Co-operative Society) for almost completely avoiding all references to Parliament in proposing a toast in its honour. Mr. Walker said that, in these days of political turmoil and economic uncertainty, members of Parliament had depressing duties to perform, and if they had real responsibility they were faced with a big task. Despite the fact that that day the Parliamentary session was opened, on the previous night he had worked at his office until after midnight. He joined heartily in the general laugh that followed his declaration that men found it difficult to get into Parliament, but, if they worked conscientiously, their difficulties were considerably increased after they had been returned. "But," he added, "if it is difficult to get into Parliament now it will be considerably harder to get in at the next elections with a reduction in the number of members."—"Brisbane Courier."

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

BABY IS NINE MONTHS OLD.

The "transitional period" is the name we sometimes apply to the stage following the end of baby's ninth month. It is a stage of transition in many ways—from milk feeding to mixed foods, from sucking to eating and drinking, from simple crying to commencing speech, from inability to move about to the liberty of crawling and toddling. What stirring times! What rapid development! So rapid, indeed, that we are apt to forget the transition in the accomplished facts. It is well to keep the idea of gradualness always in mind. Never make sudden large changes. The digestive organs have so far been accustomed to deal only, or almost only, with milk; they need education to deal with other foods. Much digestive trouble results from too sudden and too early introduction of a large variety of foods. The same thing applies to methods of taking food. Hitherto baby has been accustomed to take his food only, or almost only, by sucking. Sudden change throws a strain on the nervous system as well as on the digestion.

Learning to Eat.

A point which is often overlooked is that milk should continue to supply by far the greatest part of the nourishment needed during the remainder of the first year, and, indeed, right through the second year in gradually less proportion. From nine months to twelve months food other than milk is mainly of importance in educating baby to the feel and taste and digestion of solid and semi-solid food. The important thing during this period is that he should learn how to eat. He should learn to eat from a spoon and drink from a cup, and, most important of all, he should learn to bite his crusts and learn not to swallow anything solid before it has been chewed to a pulp. Once learnt this lesson will stand him in good stead throughout his life, helping to protect him from indigestion, decayed teeth, and many other evils which follow from them. Also he will be much less likely to swallow things he may pick up than the baby with whom the act of swallowing follows almost automatically the placing of anything in the mouth.

The best kind of hard food for him is bread about one day old, cut into slices of not more than half an inch thick, and baked hard, crisp, and dry in a slow oven. These home-made rusks may be kept for several days in a dry tin closely closed. They are hard, but not tough, and do not break into dangerous leathery lumps as ordinary crusts may do. But baby must never be left alone with any sort of crust or rusk until he has learnt to chew it thoroughly before trying to swallow it. While he is learning this he should also learn to eat other sorts of food, commencing with barley or oatmeal jelly prepared and given as recommended in the Queensland Mothers' Book. Do not forget that during this period milk is the most important part of the diet for his nourishment, while the solid foods are important as a part of his education. Neither can replace the other. Baby must have enough milk and daily lessons in biting and eating if he is to reach his first birthday well up to the mark in every way.

Common Colds.

What are "common colds"? How do we get them? Why are they more common in winter? How may they be avoided? Are they ever dangerous? Can they be made less dangerous? These are a few very practical questions, and they can be answered. If more attention were paid to these answers a great deal of illness and many deaths among infants and young children would be prevented.

A "common cold" is an infectious disease just like measles and whooping cough, and it spreads in the same way. It is due to tiny disease germs, which live in the nose, throat, and air passages, and may be present in immense numbers in the

secretions from this part of the body. Little children who poke their fingers, all smeared with the secretions from their noses and mouths, into each other's faces convey the disease from one to another. Older people convey it also, not only those who are suffering from "colds" themselves, but also many who are carrying the germs, although they are apparently quite well. Visitors who delight in kissing other people's children are very dangerous persons, and should not be encouraged. Another way in which the disease is spread is more difficult to avoid. By coughing, the germs are expelled in a fine spray for a distance of several feet, and float in the air for some time.

Exposure to cold weather can never cause a "common cold" unless the person attacked happens to be at the time carrying the germs in his nose or throat. This may be the case with older people, but infants and young children always receive the infection from others. In winter people live more in closed rooms, and germs are more easily spread from one to another, so that more persons are carrying them.

An ordinary "cold" is not dangerous in itself, but by the complications which may follow it. They are chiefly inflammation of the ears, bronchitis, and pneumonia. Strong persons with ordinary care should throw off a cold in a few days, but young children, and especially infants, are in more danger. In the year 1929 in Queensland 115 babies under one year died of bronchitis and pneumonia. There is much carelessness in the protection of infants from infection. Unless the mother herself is infectious, it should nearly always be possible to protect the baby. Older children who go to school must take their chance. For them, as at all ages, the best protection is a strong, well-nourished body, the result of good feeding with plenty of vitamins. This may enable them to escape infection, or to recover from it quickly, unless they have been exposed to an overwhelming dose. A child with a feverish "cold" should be kept in bed for a few days; if he gets a chill while he has the "cold" he is more likely to develop complications.

THE FARM GARDEN.

It is not necessary to discuss whether the vegetable garden or the flower garden is the more valuable; we ought to take it for granted that both are essential to the complete country home. Fresh, succulent vegetables, full of vigorous vitamins, and appetising with a thousand precious ethers, make the farm table something that city folk can barely imagine.

Yet man shall not live by bread alone, and if we need vegetables for our bodies we equally need flowers for our souls—for that aesthetic hunger for the beautiful that is inherent in all of us.

Vegetable-growing is usually the task of those members of the farm household whose ordinary occupation is not laborious, muscle-straining work on the farm; and to them it represents exercise, recreation, stimulation of the bodily functions, and health.

For the younger members of the family vegetable-growing provides education in soil science, in cultural lore, in the elements of breeding, as well as in those qualities of the mind that are stiffened by adversity and nourished by success. There are pests to fight, frosts or guard against, air and water to put into the soil, and all the processes of nature to assist.

And vegetable eating is the cure for many disorders, and the proved preserver of health. Furthermore, the vegetable garden is the soil in which the herb "thrift" thrives most vigorously. A productive vegetable patch shrinks the store bill, and doctors' and chemists' bills. It does ever so much more—it trains the young people in ways of health and ways of thrift, in which they will walk all their lives. Every farm should have both a vegetable and a flower garden book,, to be able to supplement all the family knowledge of gardening, and as a reminder of what to sow and when to sow it.

Economists tell us that the fault of Australian agriculture is that it tends too much to specialise in one crop or other product, and thus the farmer is up against it when prices of his staple are low. There are side lines that the farmer with spare labour and spar capital might wisely take up; but there is one side line that calls for practically no capital, and for only spare-hour labour—the vegetable garden. And though vegetables may not bring much hard cash on to the farm, they will prevent a fairly considerable sum from going out.

Some farmers are rather contemptuous about vegetable gardening. Let such a one agree to fence, plough, and manure a quarter of an acre and pass it over to mother and the girls to make what they can of it. Let him agree to purchase all the vegetables needed for the farm table at current rates, and to market the surplus for his women folk.—"The County Woman."

THE COUNTRY WOMAN.

By arrangement with the Domestic Science and Technical Services of the Department of Public Instruction, information of especial interest to country women is published regularly under this heading.

SIMPLE COOKING.

FRIED CUTLETS AND TOMATOES.

Materials—1 lb. cutlets; 1 tablespoonful flour; 1 teaspoonful salt; ½ teaspoonful pepper; 1 cup bread crumbs; yolk of 1 egg or 1 tablespoonful milk; 3 tomatoes.

Utensils—Frying pan; chopper; board; knife; plate.

Method—

1. Trim cutlets and chop off ends of bone.
2. Dip in flour, pepper, salt, egg or milk, and bread crumbs.
3. Fry in hot fat for 15 minutes, turning twice.
4. Slice tomatoes; sprinkle with salt and pepper; fry and serve with cutlets.

MEAT PATTIES.

Materials—For pastry: ¼ lb. dripping or lard; ½ lb. flour; 1 teaspoonful baking-powder; ½ teaspoonful salt; ¼ cup water; yolk of 1 egg or 1 tablespoonful milk. For filling: ½ lb. cooked mince meat; salt and pepper.

Utensils—Bowl; sieve; teaspoon; board; rolling-pin; cutter; brush.

Method—

1. Sieve all dry ingredients into a bowl.
2. Rub dripping through with tips of fingers.
3. Add water; make into a dry dough.
4. Place on board; roll out thinly.
5. Cut out with a round cutter; line pie tins.
6. Add meat; cover with a smaller round of pastry.
7. Brush over with egg or milk; make a hole in centre of each patty.
8. Bake in a hot oven for 20 minutes.

Sufficient for 1 dozen pies.

BOILED POTATOES (OLD).

Materials—1 lb. potatoes; 1 teaspoonful salt; water.

Utensils—Saucepan; knife; bowl; skewer.

Method—

1. Wash and peel potatoes thinly; cut into even-sized pieces.
2. Put into a saucepan; add salt; cover well with cold water.
3. Put lid on; boil till tender.
4. Strain; dry; dish in hot dish.

Note.—Put new potatoes into boiling water; boil for 20 to 25 minutes.

BAKED CUSTARD.

Materials—1 egg; 1 cup of milk; 1 teaspoonful butter or dripping; grated nutmeg; ¼ teaspoonful vanilla; 1 tablespoonful sugar.

Utensils—Bowl; whisk; pie dish; baking-tin.

Method—

1. Break egg into a bowl; whisk well; add sugar.
2. Add milk and vanilla.
3. Strain into a greased pie dish; add butter in small pieces and grated nutmeg.
4. Stand pie dish in a baking-tin; add water till it reaches half-way up the pie dish.
5. Bake in a very slow oven for half an hour.

JAM TARTS.

Materials—¼ lb. dripping or lard; ½ lb. flour; 1 teaspoonful baking-powder; ½ teaspoonful salt; ¼ cup water; ½ tin jam; yolk of 1 egg or 1 tablespoonful milk.

Utensils—Bowl; sieve; teaspoon; board; rolling-pin; cutter; brush.

Method—

1. Sieve all dry ingredients into a bowl.
2. Rub lard in with the tips of the fingers.
3. Add water; make into a dry dough.
4. Place on a board; roll out thinly.
5. Cut out with a round cutter; line patty tins.
6. Put in centre of tart half a teaspoonful of jam; brush edge of tart with yolk of egg or milk.
7. Bake in a hot oven for 20 minutes.

Sufficient for 2 dozen tarts.

LEMONADE.

Materials—1 lemon; 1 dessertspoonful sugar; 1 pint boiling water.

Utensils—Knife; squeezer; jug; strainer.

Method—

1. Peel rind off lemon in thin strips.
2. Strain juice of lemon into a jug.
3. Add rind, sugar, and boiling water.
4. Cover; strain when cold.

MUTTON BROTH.

Materials—1 lb. neck of mutton or mutton bones; 1 tablespoonful chopped parsley; 1 teaspoonful salt; 1 tablespoonful barley or rice; pepper; 1 onion; 1 pint water.

Utensils—Saucepan; strainer; knife; basin; chopper; board.

Method—

1. Wipe meat; chop bones into small pieces.
2. Put meat and bones into a saucepan; cover well with cold water; allow to stand for 30 minutes.
3. Place on fire; add onion, salt, pepper, and washed barley or rice.
4. Simmer for two hours; remove meat, bones, and fat.
5. Add choped parsley.
6. Boil for two minutes; serve hot.

LAUNDRY WORK.

REMOVAL OF STAINS.

Wine.

Method—

1. Spread the stained part over a basin.
2. Rub with common salt.
3. Pour boiling water through.
4. Soak in clean soft water.

Fruit Stains.

Method—

1. Sprinkle salt on spot; pour boiling water over salt; *or*
2. Plunge stain into boiling milk for a few minutes; *or*
3. Apply to stain a cloth dipped in dilute oxalic acid.

Note.—In all cases, rinse quickly.

Ironmould.

Method—

1. Stretch stained part over a basin of boiling water.
2. Moisten; rub in salts of lemon.
3. Pour boiling water through spot.
4. Rinse well in warm water.

Blood.

Method—

(a) 1. Wet the stained material with peroxide of hydrogen.
2. If the stain is not removed when the spot is dry, repeat.

(b) 1. Soak in cold water with a little salt.
2. Wash and squeeze well until stain is removed.
3. Soak in clean soft water.

Note.—Hot water, soap, and soda fasten the stain.

Mildew.

1. Stretch the mildewed material over a hard, firm surface.
2. Dust the surface with chalk; rub it well with a dry cloth.
3. (a) Rub in salt and lemon juice; *or*
   (b) Make a paste of French chalk and water; spread over stained part.
4. Dry slowly in the sun; repeat either process if necessary.
5. Soak in warm soft water.

Notes—

1. Mildew is one of the most difficult stains to remove without injuring the fabric.
2. Clothing and household linen become mildewed quickly in damp weather.
3. Materials become mildewed if put away damp; hence the importance of airing every article thoroughly.
4. Whiting may be used instead of French chalk.

Wet Paint.

1. Rub the stained part with turpentine.
2. Hang the garment or material in the sun.

Dry Paint.

1. Mix together equal quantities of ammonia and turpentine.
2. Rub the stained part with the mixture.
3. (a) If the material is wool, hang it out in the sun.
   (b) If the material is linen, cotton, or silk, wash well in warm soft water.

Tar.

1. Rub the stained part with mutton fat or dripping.
2. Wash in warm water.

Grease or Oil.

(a) 1. Soak the article in cold water.
2. Add borax.
3. Wash in warm water.

(b) 1. Make a paste of fuller's earth and water.
2. Spread over stained part.
3. Allow to remain for 30 minutes; brush off the fuller's earth.

FRUIT PRESERVING.

Various Methods.

Canning.—Fruit, vegetables, meat, and fish are sterilised at 160 deg. to 212 deg. Fahr. and sealed in jars or cans.

Preserving.—Fruit sterilised with or without sugar are sealed or covered in jars or bottles.

Vegetables are sterilised in water to which salt has been added, and sealed in jars.

Jam-making.—Fruit are broken up, or in the case of berries used whole, sterilised, sugar is added, the mixture is boiled till a certain degree of thickness is attained, the jam is then bottled and sealed.

Jelly-making.—Fruit-juice is obtained by gentle cooking and thorough straining, it is then boiled with sugar, bottled and sealed.

Pickling.—Fruit and vegetables are sterilised; vinegar, spices, and sugar are the preservatives used.

Drying.—Fruit and vegetables, protected from dust and insects, are slowly dried by the sun's heat or artificial heat.

Crystallising.—Fruits are peeled, stoned if necessary, or otherwise treated, reheated in heavy syrup, and drained, as often as necessary for the special fruit being treated.

Note.—Vegetables should be prepared according to kind. After preparation they should be plunged into boiling water (asparagus requires modified treatment) and left in it for two minutes; the water must then be poured off and replaced by cold water; after pouring off the cold water vegetables are packed into jars, covered with cold water to which salt has been added, the cover should be screwed down tightly and then unscrewed half a turn. Rubber rings must not be adjusted till after sterilisation. Jars are put into steriliser or boiler and covered with cold water, brought to the boil very slowly and kept at boiling point for 1½ to 2 hours; jars after removal from boiler should be filled up with boiling water, sealed, allowed to stand for two days, and tested for a vacuum. A little sugar may be added to the water for white vegetables to improve the flavour.

Jam-Making.

In order to get the best results, good fruit in the best condition must be used.

The fruit must be ripe but not over-ripe; jam made from green peaches or imperfect fruit of any kind may be fit to use, but it does not keep well, and cannot be compared with a preserve made from properly developed and fine fruit.

All fruits must be thoroughly cleaned. Best results are obtained when fruits are prepared the day before the jam is made.

Apricots, nectarines, and peaches must be carefully peeled and stoned; the kernels of about one-quarter of the stones should be blanched and added to the fruit after the sugar has been added.

Plums should not be peeled; the stones may or may not be removed. Berries, such as gooseberries, mulberries, raspberries, and strawberries should be washed and dried carefully. Fruit prepared the previous day must be kept in earthenware dishes; pie-melons should be sprinkled with a small amount of sugar and allowed to stand for twelve hours; citrus fruits when cut up should be kept in earthenware dishes; a small quantity of water should be added; the seeds and stalks of rosellas are removed and kept in one dish; the remainder of the fruit is placed in another dish. To all fruits sufficient water is added to prevent the fruit sticking to the preserving pan. The bottom of the pan should be buttered; two or three glass marbles may be used to prevent the fruit sticking to the pan.

Berries and sugar are placed in the pan together; these fruits should not be stirred in such a way that they are mashed or broken. In making jam from apricots, citrus fruits, melons, peaches, pears, pineapples, plums, quinces, and rosellas, the fruit must be boiled till tender before the sugar is added. The cooking must be slow.

The amount of sugar to be used varies from half a pound to one pound to the pint of cooked pulp; it depends upon (*a*) the kind of fruit, (*b*) its condition.

Scum rises freely while some fruits are being cooked; if it forms a thick toughish layer it must be removed. The time required for cooking varies; in the case of berries the time must not exceed thirty minutes; apricots, damsons, and firm peaches require one hour; melons, pears, pineapples, and quinces may require two hours before the sugar is added, and from half an hour to one hour afterwards. Cooking is completed if a small portion of the fruit sets when dropped from a spoon on a cool surface.

If jam or jelly is boiled too long it will not set. Most jams should be bottled and sealed down while hot; jams made from berries should be allowed to cool before bottling; if bottled while hot the berries rise to the top of the bottle.

Bottles may be covered with white paper dipped in white of egg or boiled starch; if corks are used, they should be dipped in melted wax and forced into the bottle, the top should then be covered with wax. If the bottles have lids, care must be taken to screw them down tightly.

In dry sunny weather jam made from first-class fruit, after bottling, may be allowed to stand for twenty-four hours before being sealed; the bottles should be covered with cheese-cloth to keep off dust; a layer of melted parowax should then be poured over the surface in each bottle; the bottles may be covered with paper; preserves treated in this way should keep for months.

It is advisable to make preserves from fruit gathered in wet weather or after heavy dew.

CABBAGES.

To grow cabbages well plenty of manure should be used. There is no manure to which this crop responds so well as animal. For heavy lands horse manure, and for light soils cow or pig are respectively the best when they can be obtained. If the soil is of a poor quality, dig the ground two spits deep, and put a good layer of manure between the two spits. This is especially necessary in the case of autumn or summer crops, which have to stand a dry spell. Spring cabbage—that is, those that are planted in the autumn for use in the spring—do well if planted on ground that has been well worked and manured previously for peas or onions, and on such ground cabbages can be planted without any fresh manure being added. Of other manures lime is an important factor in successful cabbage culture; it is chemically and mechanically beneficial to the soil and the cabbage tuber. It should be applied at the rate of about 2 lb. to the square yard, and is particularly necessary to heavy soils and those rich in humus. Superphosphate at the rate of 2 oz. to the square yard is good, but should not be applied at the same time as lime or to soils that are infected with club root. When the crop is nicely established, apply 1 oz. of sulphate of ammonia to heavy, damp land, or 1 oz. of nitrate of soda per square yard in the case of light or sandy soil. Nitrate of soda is a splendid fertiliser for the cabbage family. When especially fine heads are required, water the plants once or twice during the growing season with the following mixture:—1 oz. of iron sulphate and 2 oz. of sulphate of ammonia dissolved in 1 gallon of water.

KITCHEN GARDEN.

Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of this, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be a great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly-dug beds. What the action of salt is is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders the soil sterile and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 ft. apart and 18 in. between the plants, and the climbing sorts 6 ft. each way. Sow Guada beans, providing a trellis for them to climb on later. Sow cucumbers, melons, marrows, and squash at once. If they are troubled by the red beetle, spray with Paris green or London purple. In cool districts peas and even some beetroot may be sown. Set out egg plants in rows 4 ft. apart. Plant out tomatoes 3½ ft. each way, and train them to a single stem, either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinnach, lettuce, vegetable marrows, custard marrows, parsnips, carrots, chicory, eschalots, cabbage, radishes, kohl-rabi, &c. These will all prove satisfactory provided the ground is well worked, kept clean, and that water, manure, and, where required, shade are provided.

THE HOME VEGETABLE GARDEN.

Fresh vegetables, especially vegetables containing vitamins, are essential to good, robust health, and medical men are now advising people to ''eat more vegetables.''

The growing of vegetables not only means a saving of money, but educates the children by inculcating a desire to have their own gardens in later life, and so help to keep down the costs of living.

Vegetable-growing is not only a healthy occupation, but it also provides exercise and recreation. In the suburbs it has a tendency to keep young people contended at home, and to trouble less about going to horse races and places of gambling. With country people who, perhaps, are less in need of exercise, gardening is a delightful hobby.

It enables private gardeners to improve the strains of vegetables by a careful selection of seed, much in the same way that a flockmaster improves his sheep; and much satisfaction, and, not unusually, generous reward, are to be gained from this work.

The home garden enables the testing out, in a small way, of the newer varieties of vegetables, which work is not always possible, or, if it is possible, not payable with the professional or commercial gardener. The amateur gardener will find this work both fascinating and health-giving.

Farm Notes for September.

With the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghum, melons, pumpkins, cowpeas, broom millets, and crops of a like nature, provided, of course, that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Check-row seeding in this crop is to be recommended, permitting as it does right-angled and diagonal cultivation by horse implements, minimising the amount of weed growth, and at the same time obtaining a soil mulch that will, with the aid of light showers, assist to tide the plant over its critical period of "tasselling."

Although cotton may be sown this month, it usually stands a better chance if deferred until October. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing.

The following subsidiary crops may be sown during the month:—Tobacco and peanuts; plant sweet potatoes, arrowroot, sugar-cane, and cow cane (preferably the 90-stalked variety), and in those districts suited to their production yams and ginger. Plant out coffee.

Orchard Notes for September.

THE COASTAL DISTRICTS

September is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the southern half of the State—it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as, if the trees are not in this condition, they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the trees; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by systematic cultivation, except in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given is the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are is vigorous growth, or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth—the orchard should be manured with a quick-acting, complete manure, such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the foregoing has been written mainly in respect of citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug, and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Care should be exercised in the selection of suckers, butts, or bits. Either of the two latter are preferable, and in the case of suckers which have broken into leaf, these should also be cut hard down to the butt. Before planting, all roots should be cut off closely and the surface pared or scraped, excepting over the buds or eyes which are allowed for development. Where the butts are split into sections (up to four) according to the number and placements of eyes, these are planted with the eye or eyes facing downwards. In the case of butts, two to three eyes are left spaced around the butt, and surplus ones being removed, the top having previously been cut down to the corm and the centre scored out. Better growth is evidenced in each case, and as no cut surface is made available (each "plant" being covered by a few inches of soil immediately) beetle borer infestation is not shown.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers; also all bases of plants which have fruited.

When necessary, manure—using a complete fertilizer rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash —two of the former to one of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared —viz., brought into a state of perfect tilth to a depth of at least 1 ft.—more if possible—not scratched, as frequently happens; and when the soil requires feeding, it should be manured with a complete manure, which should, however, contain no superphosphate, bonedust or Nauru phosphate being preferable.

Old plantations should be kept in a good state of tilth and be manured with a complete fertiliser in which the phosphoric acid is in the form of bonedust, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable passion vines can also be pruned now, as if cut back hard they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed with Bordeaux mixture from then till the time the fruit is ready to colour, in order to prevent loss by downy mildew or anthracnose. Sulphuring may be required against powdery mildew.

Where leaf-eating beetles, caterpillars, or other insects are present, the trees or plants on which they are feeding should be sprayed with arsenate of lead. All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Where not already completed, the winter spraying with lime-sulphur should be finished as early in the month as possible. Black aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

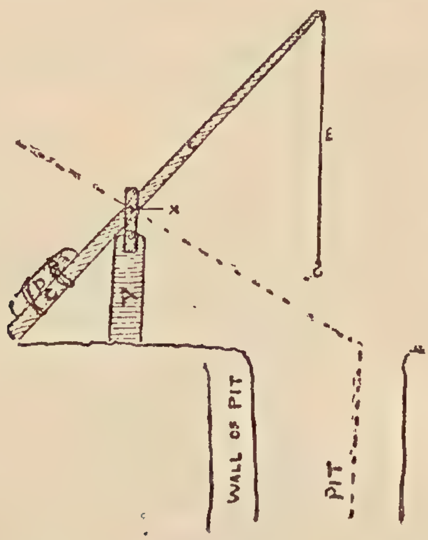
In the warmer parts, which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

SILO PIT ELEVATOR.

"I have found the following contrivance successful for elevating ensilage from a pit," writes a correspondent of a South African paper:—

This device has been in use for very many years for raising water, especially in Egypt.



All that is necessary is a long pole, a length of rope, a short stout pole, old wagon tyre, and a few bolts; also a heavy stone.

A short pole partly burned; CC the long pole; D the stone; E the rope; B piece of wagon tyre bolted to "A"; X is the pivot. Dotted lines show the position of pole when down.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

Date	August, 1931. Rises.	August, 1931. Sets.	September, 1931. Rises.	September, 1931. Sets.	MOONRISE. Aug., 1931. Rises.	MOONRISE. Sept., 1931. Rises.
1	6.38	5.18	6.10	5.34	p.m. 7.47	p.m. 9.7
2	6 38	5.18	6.9	5.34	8.38	10.2
3	6 37	5.19	6.8	5.35	9.30	10.58
4	6 37	5.19	6.7	5.35	10.21	11.56
5	6 36	5 20	6.6	5.36	11.15	...
6	6.35	5 20	6.5	5.36	...	a.m. 12.54
7	6 35	5.21	6 4	5 37	a.m. 12.11	1.53
8	6 34	5.22	6.3	5.37	1.8	2.50
9	6.33	5.22	6.2	5.38	2.7	3.45
10	6.32	5.23	6.0	5.38	3.5	4.32
11	6.31	5.23	5.59	5.39	4.7	5.14
12	6.30	5.24	5.58	5.39	5.5	5.50
13	6.29	5 24	5 56	5 40	5.58	6.26
14	6 28	5 25	5.55	5.40	6.45	7.2
15	6.27	5.25	5.54	5.41	7.23	7.40
16	6.26	5.26	5 53	5.41	7.58	8.16
17	6 26	5.26	5 52	5.42	8.23	9.1
18	6.25	5.27	5 51	5 42	9.7	9.52
19	6.24	5.27	5.50	5.43	9.41	10.49
20	6.23	5.28	5.48	5.43	10.19	11.46
21	6.22	5.28	5.47	5.43	11.6	p.m. 12.43
22	6.21	5.29	5.46	5.43	11.57	1.41
23	6.20	5.29	5.45	5.44	p.m. 12.54	2.41
24	6.19	5.30	5.44	5.44	1.52	3.35
25	6.18	5.30	5.43	5.45	2.50	4.28
26	6.17	5.31	5.42	5.45	3.47	5.20
27	6.16	5.31	5.40	5.46	4.47	6.11
28	6.15	5.32	5.39	5.46	5.43	7.1
29	6.14	5.33	5.38	5.47	6.32	7.56
30	6.13	5.33	5.37	5.47	7.25	8.51
31	6.12	5·34	...	...	8.15	

Phases of the Moon, Occultations, &c.

7 Aug.	☽	Last Quarter	2 28 a.m.
14 ,,	●	New Moon	6 27 a.m.
20 ,,	☾	First Quarter	9 36 p.m.
28 ,,	○	Full Moon	1 10 p.m.

Apogee, 3rd August, 5.48 p.m., and 31st August, 7.24 p.m.
Perigee, 15th August, 7.54 p.m.

A daylight spectacle for owners of a telescope or binoculars will be afforded by the Moon and Mars on the afternoon of the 17th August. By shading off the Sun it will be possible to observe an occultation of Mars when the dark edge of the Moon reaches it, about 2.30 p.m. About an hour later the planet will be seen on the opposite or bright side of the Moon, but not quite so clearly visible. On the following morning the Moon will be passing from west to east of the first magnitude star Spica, an occultation being visible only at places further north than Cairns, such as Darwin.

The best occultation for general observers will be early in the evening of the 21st, when, throughout Australia and Tasmania, Antares, the first magnitude star in the Scorpion, will be hidden by the Moon for more than an hour in the far north, but for a much shorter time in Tasmania.

On the night of the 31st of August, Venus will be passing from west to east of Neptune, which will be little more than a Moon's breadth to the south and invisible to the naked eye.

Mercury will set at 7.17 p.m. on the 1st, and at 7.26 p.m. on the 15th.

Venus will rise at 6.1 a.m., thirty-seven minutes before the Sun, on the 1st; on the 15th it will rise at 6.9 a.m., eighteen minutes before the Sun.

Mars will set at 9.16 p.m. on the 1st, and at 9 p.m. on the 15th.

Jupiter will rise at 6.23 a.m., only fifteen minutes before the Sun, and set at 4·57 p.m., or twenty-one minutes before the Sun, on the 1st; on the 15th it will rise at 5.38 a.m., forty-nine minutes before the Sun, and set at 4.16 p.m., sixty-nine minutes before the Sun.

Saturn will rise at 3.48 p.m., and set at 5.28 a.m. on the 1st; on the 15th it will rise at 2.49 p.m. and set at 4.28 a.m.

The Southern Cross will be upright about 4 p.m. on the 1st of August, at 3 p.m. on the 15th, and at 2 p.m. on the 31st. It will, therefore, be bending downwards to the right, and will reach the horizontal position at 10 p.m. on the 1st, at 9 p.m. on the 15th, and at 8 p.m. on the 31st.

5 Sept.	☽	Last Quarter	5 21 p.m.
12 ,,	●	New Moon	2 26 p.m.
19 ,,	☾	First Quarter	6 37 a.m.
27 ,,	○	Full Moon	5 44 a.m.

Perigee, 13th September, 3.24 a.m.
Apogee, 27th September, 12.42 p.m.

Mercury will be passing from east to west of the Sun, between the Earth and the latter on the 5th. On this occasion it will avoid a transit of the Sun's disk by rather more than 3 degrees; Mercury being on the southern side or above the Sun at midday. It will then be more than 55 million miles from the Earth. Three days later Venus will be passing the Sun from west to east on its far side and apparently closer to the Sun, but its distance from the Earth will be about 160 million miles.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/- including postage.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXVI. 1 SEPTEMBER, 1931. PART 3.

Event and Comment.

The Brisbane Show.

QUEENSLAND'S great August festival, the Brisbane Show, was in keeping with the highest traditions of Australian agriculture. The career of the Royal National Agricultural and Industrial Association of Queensland has been marked by exceptional achievement, and its pavilions and its rings have never failed to present a representation of all that is best in a great primary producing State and one of the best stock-raising countries in the world. To many exhibitors success at Brisbane means an endorsement of quality, in beef and dairy cattle particularly, that would be recognised in any show ring in the Commonwealth. The 1931 Brisbane Show, the fifty-sixth of the series, was a crowning display symbolic of the rural wealth of a vast and richly endowed Province. In soil and climate, few countries in the world can offer a greater and richer variety than Queensland. Most, if not all, of the known economic plants, whether requiring temperate or torrid conditions, can be produced prolifically within its borders. Its whole range of climate embraces the winter snows on its southern uplands, the cool conditions of the tableland territories from Darling Downs to Atherton, the dry, clear atmosphere of the western plains, and the humidity of the central and northern tropical coastal regions. Its soils range from the lighter loams to the heavy black alluvia of extensive river flats, and the rich volcanic soils of dense tropical jungles. It is no wonder, then,

that the Brisbane Show, which is really a microcosm of the whole State, should prove an annual revelation of rural richness of which few countries can boast more generous measure. Added to that was the convincing evidence which the manufacturing industries provided of the interlocking of land and secondary enterprises, and the community of interests by which are linked the life and work of town and country.

Departmental Display.

SPACE demands in this issue forbid an extended account of this year's Brisbane Show, but the pictorial record presented will make up for any omission in that regard. Speaking of the Exhibition, the Minister for Agriculture and Stock (Mr. H. F. Walker) expressed especial pleasure with the entries in the stock sections. From an agricultural point of view, he said that the show was equal to any he had seen in recent years. He was greatly impressed with the wide range of products of the highest excellence from the cooler south to the tropical north, and the whole show was a wonderful representation of the industrial life, both primary and secondary, of Queensland. The fine display made by his Department in the Court of Agriculture was especially commendable. The service of science to the farmer was there strikingly illustrated, especially in respect of the biological control of prickly-pear through the agency of which a vast territory would eventually be brought into profitable production. He believed that the true way of overcoming the country's economic difficulties was by greater production, and the Departmental display would convey to the people of Queensland the enormous agricultural capacity of the State and the value of the plans and methods adopted for its successful exploitation.

Agriculture in Queensland.

MR. WALKER, in the course of a notable speech in the Legislative Assembly recently, referred to the outstanding importance of primary production at the present time, especially of the principal commodities in our trans-marine trade, and the development of which through his Department he is doing his best to foster. Besides wool, he said, we have great wealth in cattle, sugar, dairying, wheat, maize, barley, fruit, cotton, tobacco, arrowroot, peanuts, and poultry, quite apart from our immense mineral resources.

Dealing with tobacco growing prospects, he mentioned the scheme launched by the Government under which twenty-five farms have already been established successfully at Mareeba, in North Queensland. This year a further area, embracing 200 to 300 tobacco farms, would be set aside for settlement. The tobacco policy of the Government would extend over the arable regions of the State, and there was no reason why the smoking requirements of the whole of the Commonwealth should not be grown on Australian soil. When it was remembered that £2,500,000 worth of tobacco was imported every year, the economic importance of the successful revival and extension of this industry was immediately realisable. The Mareeba settlers had had the benefit of a practical training under departmental officers and that policy would be continued as far as possible. Each trained farmer would also be in a position to impart his knowledge to his neighbours, and so the good work would go on. The Government planned, continued Mr. Walker, to conduct experimental trials in six widely separated districts, namely, Collinsville, Byfield, Bundaberg, Maryborough, Beerburrum, and Amiens. Every experiment would be carried out on sound commercial lines.

Reclamation of Pear-Infested Lands.

THE MINISTER discussed other directions in which experiments had been carried out, making special reference to the reclamation work proceeding at Palardo, in the Eastern Maranoa district, where nine trial plots had been established. As a result of those experiments, in place of prickly-pear on land which for many

years had been completely unproductive because of the infestation, there were areas growing dwarf Essex rape yielding 14 tons to the acre, and barley yielding 10 tons to the acre, besides other fodder crops and grasses providing equally heavy harvests. "It is not too much to say that we shall see many cattle coming down in excellent condition after having been grazed on that reclaimed country," Mr. Walker added, and then went on to refer to the experiments in pasture improvement continued under his direction in the North and South Coast districts, the results of which would eventually add immensely to the output of the dairying industry and the general wealth production of the State.

Pig-Feeding Experiments.

CONTINUING, Mr. Walker assessed the value of the pig feeding experiments in progress at the Yeerongpilly Stock Experiment Station, the first results of which were published in the August number of this Journal. The published tables gave some idea of the possibilities of the economic utilisation of surplus or low-priced products and the study of them, and all their implications, was to be commended. The low rates ruling for cereals prompted the trials, the object of which was to test the feeding values of barley, maize, and wheat when fed in combination with protein-rich supplements. In his opinion the final results would prove a revelation and would tend to revolutionise the pig industry, ensuring the farmer a fairer return for his enterprise than he received at current market prices. One exporting firm was shipping 50,000 pork carcasses yearly, and the possibilities of the extension of that trade were being fully exploited. With the opening of the new abattoirs on the Brisbane River the exploitation of the export pork trade would, no doubt, be further facilitated.

Efficiency of the Sugar Industry.

COMMENDING the several growers' organisations for their able presentation of the case for the sugar industry before the recent Federal Committee of Inquiry, Mr. Walker said that through their efforts they now had a fair working agreement by which the interests of all concerned were reasonably conserved. Emphasising the efficiency of the Queensland sugar industry, he stated that it now takes only 6.84 tons of cane to make 1 ton of sugar, while thirty years ago it took 10.09 tons. In the same period the acreage yield of raw sugar had been doubled. That fine result had been brought about through the excellent work of the sugar experiment stations, and provided another instance of the great importance of applied science to agriculture.

Dairying Development.

REVIEWING the remarkable development of dairying in Queensland, Mr. Walker reminded the Assembly that its present annual value was within the vicinity of £8,000,000. Production was on an ever-ascending scale, and last year the "peak" for the State was reached with a record output of 93,894,101 lb. of butter. It was not only a record in weight, but also in grade. The value of the exportable surplus actually shipped was £3,326,099; in addition £213,731 worth of cheese was consigned to oversea markets. There was still much to be done in the way of herd improvement, and the increase of production per cow. Science, modern machinery, and economical production were all factors in increased dairy output, and none, so far as his Department was concerned, was being neglected. "When I point out that every additional 10 lb. of butter fat per cow produced from all the cows in Australia would increase the value of the product by something like £2,000,000 per annum, without any extension of existing dairying areas; and that an additional bushel of wheat per acre would mean another £3,000,000, it will be seen what can be done for the primary industries by the application of science," remarked the Minister, whose comprehensive review of present day development in rural enterprise in Queensland, from which only a few points have been taken, covered many other matters of importance to the producer, the consumer, and the State.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director of Sugar Experiment Stations.

PART XVIII.

(c) Mills and Milling Work—*continued.*

CONTINUING with the subject of Mills and Milling Work it should be interesting to give a description of a thoroughly modern and up-to-date sugar-mill. In previous chapters an outline of processes used in the earlier periods of sugar-milling in Queensland, almost from the very start, will be found. For the purpose of comparison, I have selected the latest mill built by the Queensland Government—viz., the Tully—which is situate on Banyan Creek, near the Tully River, North Queensland, between the Herbert and Johnstone Rivers.

I am much indebted to the Engineer of this mill, Mr. W. Pollock, and to the Sugar Technologist of the Bureau of Sugar Experiment Stations, Mr. Norman Bennett, for the following description of this mill.

Tully Central Mill.

The Tully Central Sugar Mill was erected between the years 1923 and 1925 and is situate about 30 miles south of Innisfail. The mill is erected at the foot of Mount Tyson on the site selected by the Royal Commission of 1922, and draws its cane supply from an elongated area.

Tully Mill Buildings.—The various buildings are constructed throughout with massive steel columns braced together with roll-steel joists and lattice girders, the roof is supported with steel principals of sufficient strength to withstand a cyclone. The sides of the building and roof are covered with galvanised corrugated sheet iron and bolted to the purlins and principals with $\frac{3}{8}$-inch galvanised bolts, the roof being further strengthened by having $1\frac{1}{4}$-inch galvanised angle-iron bars spaced equally over the length and breadth of the roof.

Boiler house is 209 feet long by 60 feet wide by 25 feet high.

Passage way between boiler house and crushing house is 20 feet wide.

Crushing house is 214 feet 6 inches long by 60 feet wide and 30 feet high.

Effet house is 181 feet 6 inches long by 60 feet wide by 30 feet high.

Pan house is 99 feet long by 60 feet wide by 60 feet in height.

Sugar room is 165 feet long by 60 feet wide and 30 feet high from the ground floor, the sugar being stacked 4 feet above flood water level.

Cane carrier house is 170 feet long by 30 feet wide and the highest portion is 30 feet and lower portion 20 feet high.

Fitting and machine shop is 65 feet long by 33 feet wide by 20 feet high.

Blacksmith's and truck repair shop is about 40 feet by 40 feet by 20 feet high.

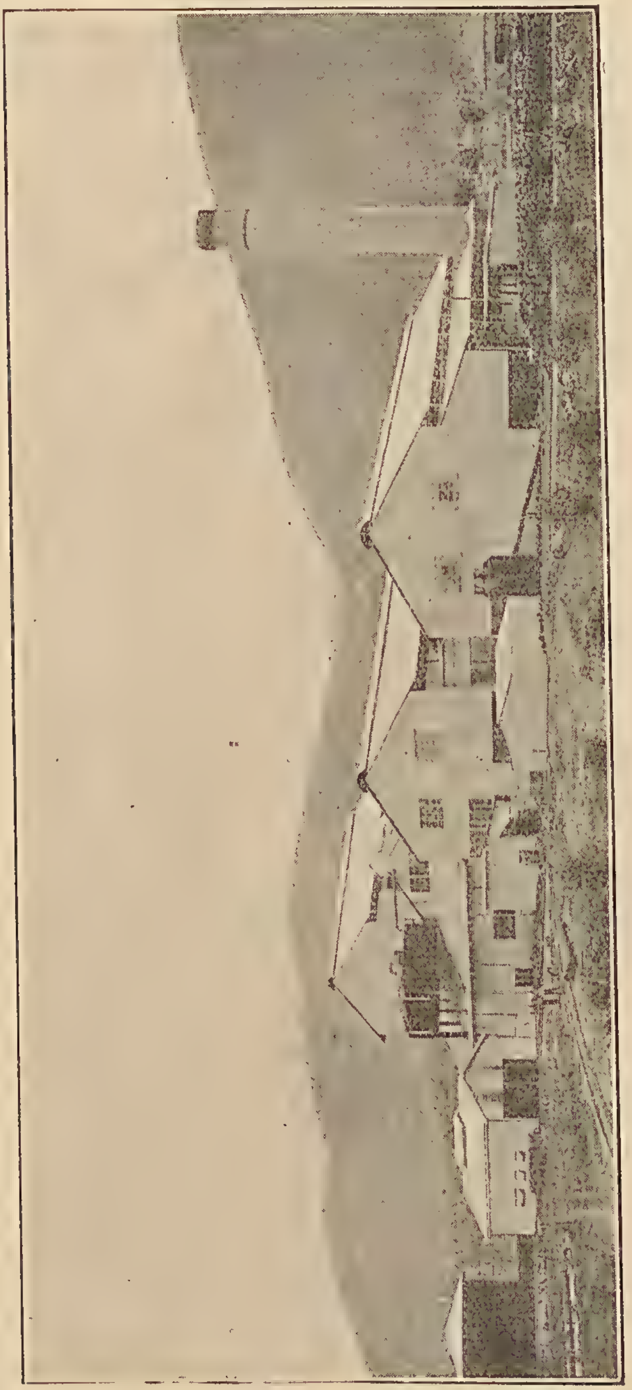


PLATE 60.—TULLY SUGAR MILL.

Tramway system consists of about 35 miles of a permanent railway. The mill is situated approximately in the centre of the railway system. This railway is the standard type used at Queensland sugar mills, being constructed with 40-lb. rails and 2-foot gauge. The various rivers and gullies along the tramline are spanned with wooden bridges of the usual type—piles being first driven into the ground and afterwards fitted with headstocks and hardwood girders, decked with hardwood planks and fitted with handrails.

Water Supply.—The water supply is obtained from the Banyan Creek, which is close to the mill. The pumping is done by two 12-inch motor-driven centrifugal pumps, each motor capable of developing 120 horse-power and delivering 200,000 gallons of water per hour. The quantity of water required for mill purposes per hour in cold weather is 200,000, and in summer about 300,000 gallons.

Cane Supply.—The cane is loaded into steel trucks and hauled into the mill by four 15-ton locomotives; these locomotives can haul on the level railway 110 trucks loaded with an average of thirty hundredweight of cane, and about 21 per cent. is brought to the mill in Government waggons carrying about 10 tons, on the 3 feet 6 inches gauge.

The makers of the locomotives used at the mill are the well-known firm of John Fowler and Company, of Leeds, England. They are four-wheel coupled and fitted with a bogie behind to enable the locomotives to negotiate the railway curves with ease.

Cane Unloaders.—The cane is unloaded at the cane carrier with the David's Patent Unloaders; these unloaders are motor-driven through reduction gears. There are two unloading platforms for the large Government wagons and a tip for the small trucks. This tipping arrangement is worked with a motor-driven reduction gear connected to a quadrant under the tipping platform. The cane trucks are hauled from the weighbridge with motor-driven winches and the trucks are secured to the tipping platform with two chains which prevent the trucks from falling into the carrier when they are being discharged. One truck can be discharged in a few seconds by this means. Empty trucks are hauled away into the various railway sidings by motor-driven winches. The cane carrier is driven with a double cylinder 15 horse-power geared winch.

Levelling Knives.—There is placed half way on the carrier, one revolving shaft; attached to the shaft there are thirty-two cane levelling knives making 350 revolutions per minute; these knives cut the cane and level it down considerably.

At the top of the carrier there is another set of similar knives, these revolve at 450 revolutions per minute, and further cut up the cane as it falls into the Searby Shredder, this shredder revolves at 1,200 revolutions per minute and chops up the cane as fine as may be desired, power is supplied by a motor capable of developing 262 horse-power; diameter of shredder is 42 inches by 72 inches.

From the shredder the cane proceeds to a tandem of four mills independently driven by four piston valve engines 24 inches by 48-inches stroke. The steam pressure to the crushing engines is 100 lb. per square inch. Each mill has rollers 35 inches by 72 inches and is equipped with hydraulic gear and horizontal pushers. Both feed and delivery rolls are equipped with juice grooves and the centres of the mills are 40 feet

apart with the exception of the third and fourth mills, which are 50 feet distant.

Periphery speed of rolls at fifty revolutions per minute—engine speed; first mill 17·4 feet per minute; second mill 17·9 feet per minute; third mill 18·79; and fourth mill 19·69 feet per minute.

Each mill is fitted with hydraulic gear which maintains a constant pressure on the top roller bearings of, say, 400 tons per square inch. Each mill is driven by a separate engine capable of developing 250 indicated horse-power; diameter of cylinders is 24 inches, and length of stroke 4 feet and fifty revolutions per minute.

Crane.—There is a 20-ton electrically driven crane that travels over the mills and engines and is used for lifting the rollers, &c., when required.

The mill building is 215 feet by 60 feet span and the cane carrier shed 149 feet by 30 feet span.

The crushed bagasse is delivered to an inclined dragtype carrier, which discharges into a cross conveyor and thence to the conveyor over the furnaces. The boiler station is thus parallel to and adjacent to the crushing plant, necessitating short main steam lines.

Treatment of Raw Juices.—The expressed juices from the first and second mills are led to the juice tanks where the necessary lime is added, the liming is done automatically so that when the mills stop, the lime stops (·473 tons lime used to 1,000 tons cane).

The juices are then pumped through the superheaters into the continuous subsiders at a temperature of 214 deg. Fahr. The juices from the third and fourth mills are used as maceration on the first and second mills and approximately 47 per cent. added water is applied to the third mill as maceration. All maceration fluids are pumped on to the bagasse as it leaves the top and delivery rollers of each mill.

Muds.—The manner of dealing with the mud is what may be called a semi-Petree Process. The mud from the first subsider goes into the second juice tank and is mixed with the second mill juice, the second and third subsider muds go to the third mill juice tank and are pumped on as maceration to the cane mill.

There are three subsiders of a capacity of 8,000 gallons each, the first subsider deals only with the first cane mill juice and the second and third deals with the second mill juice. There are four juice heaters of 708 square feet of heating surface each, and one maceration water heater of 490 square feet heating surface. The temperature of the juice is raised to 214 deg. Fahr. and the temperature of the maceration fluids for the first mill 140 deg. Fahr. and the second and third mills 158 deg. Fahr.

Effets.—There is one set of quadruple effets or evaporators with 20,000 square feet of heating surface. Pressure of steam in the first calandria is 3·5 lb. and 6 inches of vacuum in first vessel, and temperature of 202 deg. Fahr.; in the second vessel 12 inches of vacuum and temperature 188 deg. Fahr.; in the third vessel 20-inch of vacuum and temperature 162 deg. Fahr.; in the fourth vessel 28 inches of vacuum and temperature 100 deg. Fahr. Steam is only admitted to the first calandria and the steam from the boiling juice of the first pot enters the second calandria and boils the juice in the second pot,

and the steam thus generated enters the third calandria and boils the juice in the third pot, and the steam from the third pot juice enters the fourth calandria and boils the juice or liquor in the fourth pot to 65 deg. Brix. This heavy liquor is then pumped from the fourth pot to storage tanks on the vacuum pan floor.

These effet vessels receive their supply of clarified juice direct from the top of the subsiders.

The boiling-house is arranged to work on the gravity system. The pan floor is 40 feet above ground level.

Vacuum Pans.—There are four vacuum pans situated in the boiling-house, two are of the calandria type being 12 feet in diameter, of 5,500 gallons capacity, and 1,375 square feet heating surface. One coil pan 12 feet diameter of 5,500 gallons capacity, and 1,100 square feet of heating surface. One coil pan 10 feet diameter of 3,500 gallons capacity and 750 square feet heating surface. There are four massecuites boiled—namely, A, AB, B, C.

A massecuite is boiled from 100 per cent. liquor, AB is boiled from 37 per cent. A massecuite and 63 per cent. massecuite from A syrup, B massecuite is boiled from 29 per cent. A massecuite and 71 per cent. massecuite from AB syrup. C massecuite is boiled from 18 per cent. A massecuite and 82 per cent. massecuite from B syrup.

The average vacuum on the pans is 26 inches, temperature of 126 deg. Fahr. All syrups are diluted to 67 Brix.

Crystallisers.—All massecuites when discharged from the pans go into the crystallisers, of which there are eight—7 feet 6 inches in diameter by 25 feet long fitted with stirring gear to keep the massecuite in motion. The crystallisers discharge into a cooler placed above the fugals, which is also fitted with stirring gear motor driven.

There are sixteen Watson-Laidlaw centrifugal machines motor driven, eight of these (40 inches by 24 inches) deal with what is called number one sugar, and the other eight 40 inches by 20 inches deal with the C sugar or low grade; the molasses from this low-grade sugar is used with the bagasse as fuel. The various syrups from the No. 1 sugar are returned to the vacuum pans and reboiled as previously stated. The 40 inches by 24 inches fugals are bottomless and self-discharging. The sugar when dried falls into a screw conveyor under the fugals, and is conveyed by this means to the sugar elevator and passed through a sugar drier into the sugar bin; on the bottom or outlet of this bin is placed the weighing machine to which are attached the sugar bags, and the bags when filled and weighed drop on to a conveyor and are then taken to the sewing machine which closes the bags and allows them to drop on to the bag-stacking machine, which conveys the bag of sugar to the railway wagons. The bags of sugar are afterwards conveyed to Townsville wharf by rail and shipped to the Sugar Refinery or overseas as required.

Mill Capacity.—The average crushing rate for the mill is 65·37 tons per hour, and it takes 6·736 tons of cane to make 1 ton of sugar.

Power.—All the auxiliary machines, pumps, &c., are motor-driven with the exception of the cane carrier steam winch. Electric power is derived from three Crompton generators driven by Bellis-Morcom steam engines. Power of generators is rated at 437 K.V.A. three phase alternating current 415 volts 608 amp, and two sets of Vickers-Petters

crude oil engines to supply light and power to the township of Tully, there being 200 consumers. Each set develops 75 horse-power 40 K.W. 3 phase alternating current 415 volts.

Boilers.—Steam is supplied by six John Thompson's water tube boilers, having 4,250 square feet of heating surface each.

Workshops are fully equipped with the latest and up-to-date machines, which enable repairs to be done expeditiously.

The following additional particulars of the Tully mill have been supplied by Mr. Bennett, the Sugar Technologist to the Bureau:—

"The sugar room is 80 feet long by 60 feet wide and 26 feet high. The room provides ample space for sugar storage and is built on concrete foundations, the floor itself being of tongue and grooved boards in order to prevent moisture reaching the stacked sugar from underneath. Two portable bag stacking machines are provided for easy storage of the sugar, if necessary.

"The water supply for the mill is drawn from a specially constructed well on the creek side. Two Kelly and Lewis centrifugal pumps capable of supplying 300,000 gallons of water per hour are connected by pipe line to the mill. The pumps are electrically controlled from the switch board in the power-house.

"In addition to the mill buildings proper, ample barrack accommodation for the workmen employed, staff houses, offices, and laboratory have been provided for. The actual dimensions of the buildings are:—

Milling-house—214 feet by 60 feet.

Evaporating-house—214 feet by 60 feet.

Boiling-house and sugar-room—214 feet by 60 feet.

Boiler and power-house—207 feet by 60 feet.

Carrier shed—170 feet by 30 feet.

A layout of the plant is attached.

"The mill, which was originally designed to crush a tonnage of 6,000 tons per week for a twenty-five-week season, has far exceeded that capacity.

"The contract for the erection was let to Messrs. Walkers Limited, in 1923, and the milling machinery and pans were made in their Maryborough works. The contract for the juice pumps, heaters, subsiders, and quadruple effet evaporators was sub-let to the Bundaberg Foundry.

"The actual construction work at the mill site was undertaken by Messrs. Barbat and Sons, and the first trial crushing commenced on the 5th November, 1925, and concluded on the 16th January, 1926. A tonnage of 32,075 tons of cane was treated. Seasonal tonnages crushed since that date were—

Year.	Tons.
1926	148,006
1927	202,856
1928	230,424
1929	207,949
1930	215,022

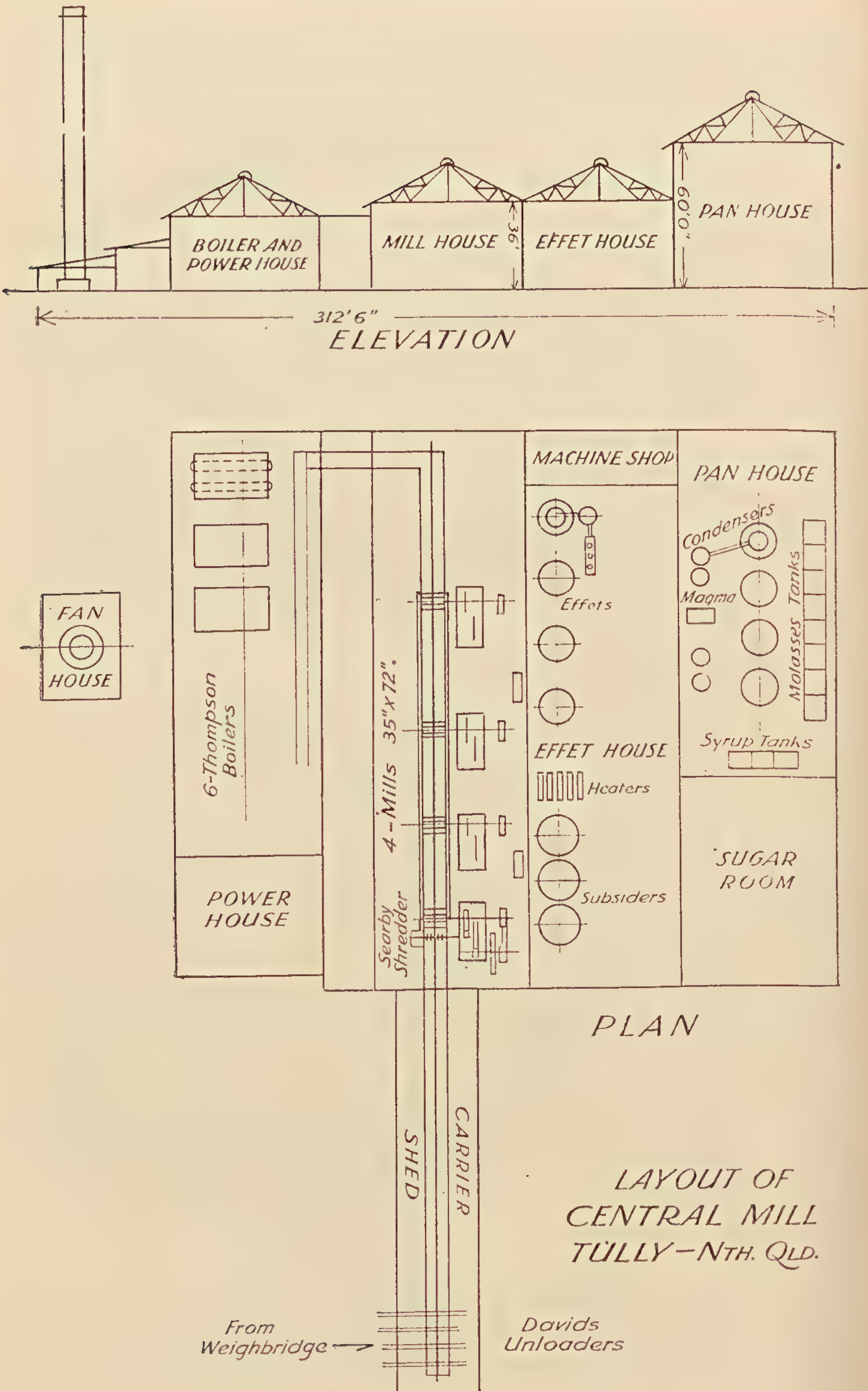

BOILER AND POWER HOUSE
MILL HOUSE
36'
EFFET HOUSE
60'0"
PAN HOUSE
312'6"
ELEVATION
FAN HOUSE
6-Thompson Boilers
POWER HOUSE
4-Mills 35"x72".
Searby Shredder
MACHINE SHOP
Effets
EFFET HOUSE
Heaters
Subsiders
PAN HOUSE
Condensers
Magma
Molasses Tanks
Syrup Tanks
SUGAR ROOM
PLAN
SHED
CARRIER
From Weighbridge
Davids Unloaders
LAYOUT OF CENTRAL MILL TULLY—NTH. QLD.

Plate 61.

"During the 1930 season, the average tonnage rate was 65 tons of cane per hour, equivalent to a weekly crushing of 8,600 tons of cane in a 44-hour week or 1,250 tons of sugar.

"Actually, the crushing plant has attained a rate of 75 tons of cane per hour, and working overtime, has crushed on two occasions last season, more than 10,000 tons of cane in a week's run. The hourly tonnage rates during these weeks were 68·5 and 67·25 tons of cane per hour.

"The mill manufactures a sugar of 98·5 pol., using lime defecation for clarification in conjunction with the Petree process.

"The syrup is concentrated to 68 Brix in the effets. Little maceration is added and the mill has been successful in operating the entire plant without the addition of surplus fuel other than molasses.

"A four massecuite and magma grain system of sugar boiling is in operation—commercial sugar being obtained from the three richer boilings. The low-grade boiling produces the magma seed which is used for foundation on the higher grade massecuites and final molasses of this final product, some 3,000 tons are burnt as fuel in the season."

It has been stated that a company was formed to grow cane in the Tully district as early as 1866, and that a mill was actually built on the Murray, the brick foundation of the buildings being all that is left. The machinery and materials were supposed to have been taken to Mackay and re-erected as the Alexandria Mill.

Mr. James Tyson, whose name is well known in Australia, also intended to grow sugar at the Tully, but the anti-black labour policy of the Griffith Government caused him to abandon the enterprise. The name of Mount Tyson, however, still remains to connect him with the district.

[TO BE CONTINUED.]

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

TILLAGE AND CULTIVATION.*

By H. W. KERR.

Why do you plough? Surely, our farmer will answer me, you are not seriously asking such a question; is it not a fundamental principle that ploughing and cultivation are absolutely essential to successful agriculture? Who would attempt to grow a crop of cane without recourse to modern tillage implements? But let us think back a little. Is it not also a fact that many of our best lands produced their heaviest crops without the aid of implements of any kind? Most of us have seen something of the results which followed the first planting of virgin scrub lands. Plant crops of 60 tons per acre were frequently harvested under these conditions, and three or four heavy ratoon crops followed, with nothing more than a light hoeing to scratch out a few weeds between the stumps and cane stools. Yet many of these cane lands to-day, even with the aid of modern cultivation implements, are not producing more than one-half of the tonnage of which they were originally capable.

Perhaps if we should study the differences between our old and new lands we should get some clue as to what our virgin lands possessed which is now lacking. And if it lies within our power to supplement the missing factors or conditions, then we should be able to restore something of the initial high-producing power of our soil.

The question of supply of available plant-foods is undoubtedly very important. This has been discussed elsewhere, and it has been shown that, without the addition of heavy applications of artificial fertilizers, the available plant-food supply in the soil becomes rapidly depleted. But there is something more than this required; for the application of even excessive dressings of fertilizer alone will restore but a fraction of the diminished crop returns, particularly if our cultivation methods are inadequate. There must then be something in the physical condition of our old soil which requires modification in order to restore its production power.

Now we probably remember quite clearly the excellent condition of tilth which characterised our virgin soil. The dense scrub growth was the natural protector of the soil in which it flourished. The heavy cover of foliage guarded the surface soil from the pounding action of torrential rains; the roots of the trees penetrated to a great depth, and the finer rootlets opened up the soil to allow free entry of the rain which fell, and stored up an adequate supply of moisture for the luxuriant plant-growth. Further, the cover of vegetation guarded the soil against the drying action of the sun and winds, and thus conserved the soil moisture for use by the natural flora. The decaying vegetation maintained in the soil an abundance of humus—that substance so important in providing an open-soil structure and increasing the water-holding capacity of the soil.

What has happened since the scrub was removed? First of all, a modest cane hole was all that was necessary to ensure the establishment of the cane crop, provided that the rainfall was reasonably good. The modified conditions made available to the crop an abundance of plant-food which normally supplied the scrub vegetation. This was effected at the expense of the soil humus, which, under our agricultural system

* Paper read at the Second Annual Conference of the Queensland Society of Sugar Cane Technologists, in March, 1931.

and our favourable climatic conditions, decomposes rapidly. Our tests have shown that under conditions of optimum soil moisture 3 tons of humus per acre may be lost to the land during a brief summer season. It would thus be absolutely impracticable, under intensive cultivation, to attempt to maintain the initial humus content of our soil.

Due to the beating of heavy rains to which our soil was now exposed, and the trampling of man and beast, the soil became packed and consolidated. The air and moisture supply, so essential to the crop, did not enter as readily; and with the passing of the first flush of fertility and heavy crop yields it became desirable to get the land under the plough. A good seed-bed was, in general, readily prepared, and again heavy crops were harvested, under favourable climatic conditions.

However, with the progress of time and under continued cane cultivation the soil seemed to lose the "life" which it earlier possessed; and only the intensive use of implements and adequate fertilizer applications can now restore something of the earlier productivity of the land.

Let us now examine our soil carefully in the field. We will generally find after, say, a second ratoon crop that the soil is firmly compacted. The loss of humus has made it more difficult to retain the favourable open structure of the soil, and the continued use of implements has further assisted in destroying the granular conditions of the soil crumbs. The heavy rains to which the land surface is exposed complete the work of driving the individual soil particles into a compact mass. If we should examine the soil at the depth to which our implements work, we would probably find (except in the case of sandy soils) that a definite plough-sole has been created, due to the packing action of that implement, unless definite steps have been taken to break it up.

We can now understand what we should aim at in all our farm cultural operations, and if we should make a close and careful study of our problem, we could probably devise a system whereby the faults which have arisen can be corrected.

Probably the most important aspect of an unfavourable soil condition is its relationship to the water economy of the crop. We know that a compact soil does not absorb and hold water as freely as does one with an open structure. Further, the presence of a hardpan in the soil prevents the free percolation of the excess rainfall of the wet season into the subsoil, and, by inhibiting the root development of the crop, forces the plant to rely on the scanty supply of the surface soil for its requirements.

All cultural operations should be carried out, then, with these facts clearly in mind; and we find that we can bring almost every phase of tillage under one of two headings—

(*a*) The production and maintenance of such a set of conditions as will allow of the free entry of as much moisture as possible into the soil.

(*b*) The retention of this moisture for use by the cane crop.

Because of the high water requirements of the crop, cane culture is effected most successfully in regions of abundant rainfall, or in areas where heavy and frequent applications of irrigation water are possible. Experiments have shown that in the production of 1 ton of cane about 30,000 gallons of water are drawn from the soil by the cane plants.

Therefore, for a 30-ton crop to be produced, the soil must be able to supply 36 acre-inches of water to the growing crop. Expressed in another way, each stool of cane in that acre of land will evaporate from its leaf surfaces no less than 150 gallons of water during the cropping period. When due allowance is made for the rainfall lost by surface run-off and subdrainage in times of heavy rain, and by surface evaporation from the moist soil, a rainfall considerably in excess of 36 inches will be required in order that our 30-ton crop will be possible. Even in districts where the rainfall exceeds twice this amount, the fact that the poor distribution during the wet season often causes excessive losses by drainage may preclude the effective use of more than 20 inches of rainfall by our crop.

We know too well that partial or complete failure of our cane crops is generally associated with an inadequate moisture supply in the spring months. During these periods of drought, crop growth is at a standstill despite favourable growing temperatures. Would it be possible to store some of the wet season's moisture in the soil for use by the crop in times of drought? If so, we might be able to combat these ills, and maintain favourable growing conditions despite the season. The solution of this problem is the secret of successful cultivation under these conditions, and in attempting to adopt a favourable system we would do well to consider some of the principles which are employed in regions where so-called "dry farming" is practised. Certain methods have been devised in areas where the rainfall is deficient whereby a supply of soil moisture is stored up prior to seeding; and in some instances good crops of grain have been grown to maturity without their having received a drop of rain during the growing period. Let us examine some of these principles, and see how far they may be applicable under our conditions.

The soil is our natural reservoir in which the water is stored for future use. It is evident, then, that the storage capacity should be large in order that the supply will be adequate. Therefore, we must see that our soil is brought to such a condition that the rain will be readily absorbed as it is received and that we have a good depth of open absorbent material. This suggests that we should plough our soil deeply when breaking up the land after the previous crop has been harvested. Wherever the soil is of good depth this is found to be an excellent practice. Deep tillage is, indeed, the secret of successful crop growth under semi-arid conditions. But, where the surface soil is, say, only 6 inches deep, ploughing to 10 inches might spell crop failure, for to bring to the surface 4 inches of "raw" subsoil, particularly when it is clayey, might completely ruin the tilth of the surface soil, besides adding a mass of material deficient in plant-food and humus. Many a farmer has had this experience, and has wrongfully condemned deep ploughing. In a case such as this it is desirable to deepen the surface soil, but this must be done judiciously—a little at a time.

Now, the value of the subsoil plough in creating a condition favourable for the ready absorption of rain water cannot be over-estimated. It is of immense assistance where a shallow soil is underlaid by a stiff subsoil or where a hardpan exists in the soil either naturally or due to the packing action of implements. The efficient subsoil plough does not bring the subsoil to the surface but simply cuts a gash in the compact substratum which allows of the free passage of the rain water from the saturated surface soil to the lower depths of our reservoir. It also

provides a passage-way for the roots which will penetrate to these depths and make this moisture available to our crop in time of need. It is well known that cane roots are found at depths of 3 and 4 feet below the surface, provided they are not shut out by the presence of an impervious hardpan or subsoil. Unfortunately, the subsoiling implements which one commonly sees in this country are not correctly constructed. They are generally too broad at the point, and require tractor power to draw them through the subsoil. An efficient plough should be no more than an inch in width at the point, and the cutter or blade should not exceed one-half inch in thickness. Such a subsoil plough can be drawn by two horses, and will cut a gash from 10 to 16 inches in depth below the bottom of the furrow. It is customary to follow with the subsoiler in every second furrow ploughed with our mouldboard or disc plough. Subsoiling is of no value in a sandy subsoil, as one might expect; but for heavy soils its value in allowing of the free penetration of water and air into the substrata cannot be over-estimated. After this treatment has been given it will be found that a hardpan rapidly disintegrates.

A soil prepared in this way may be capable of holding up to 25 per cent. of its weight of moisture; hence it will be seen that to a depth of, say, 30 inches over 7 inches or about one-fifth of that required by our 30-ton crop may be stored. A soil inadequately prepared may hold only 3 inches of available water in its surface foot.

Having provided for the uptake of this valuable moisture, we must guard against its loss so far as we are able. The chief avenues of escape are by surface evaporation and weed growth. When a soil is compact, and the surface becomes dried out, moisture is drawn up by capillary action from lower depths, and is readily lost from the land. Now, it is found that if the soil surface can be kept in the form of a loose dry mulch the soil capillaries are effectively broken, and evaporation losses are minimised. Again, weeds and grasses require water for growth equally as much as does cane, and every gallon diverted for their use means so much less for our crop; hence the necessity for intensive surface cultivation either with the discs or scarifiers after each rain to eradicate weed growth and restore the surface mulch. It has been found that a 2-inch mulch is quite sufficient in this respect, and deeper cultivation during the cropping period may even be detrimental; for the majority of the feeding roots of the crop are concentrated in the surface soil, and it is from this layer that the crop draws the major portion of its plant-food. But if heavy rains have compacted the surface soil to such an extent that the absorption of further rainfall will be seriously hampered, deeper cultivation, though it may cause a certain amount of root-pruning at the time, will be of ultimate benefit. Deep working of the interspaces is frequently called for in our Northern climate when the crop is young.

The time at which these operations should be carried out is of the greatest importance. All our efforts must be directed towards the production of a favourable medium for free root development and water absorption, as was our scrub soil in its virgin state. At that time the soil possessed the desirable granular or crumby structure which is characteristic of a soil "in good heart." Paradoxical though it may seem, the more one works the land in an attempt to induce this structure, the worse becomes the permanent physical condition of the land; and it grows increasingly more difficult to restore a good tilth under continuous cultivation. A soil when worked at the right moisture content

mellows down readily, but if worked either too wet or too dry, the soil becomes either puddled or reduced to dust, and our desirable granular structure is lost. We should aim, therefore, at carrying out all operations when the soil is in the proper moist condition. Of course, this is not always possible, particularly when spring ploughing; however, a little care and forethought will often show that it is possible to achieve this to a very considerable extent. With a light-textured soil liberties may be taken, but on heavy land failure to work the soil just at the right time is fatal, and it may take years to wipe out the damage which can be caused by ploughing a heavy soil a day too soon.

The season at which land should be ploughed is a question which has received all too little attention. How frequently one sees a grower breaking up his hard soil in the months of June and July in preparation for a spring plant! The surface is often covered with trash and weeds which have seeded freely. The ploughing and reploughing of the land result in a considerable loss of moisture at a season when our rainfall is notably deficient. Under the cool and dry conditions, the crop residues do not rot well, and at planting time much undecomposed material is found in the soil. Frequently it is necessary to wait for spring rains before planting; and, knowing as we do so well the capricious nature of the weather at this season, is it any wonder that the crop is frequently a failure?

My observations, covering the majority of the Queensland cane districts, show that in general an autumn plant yields the most successful crop; and I would present for your criticism a system of land preparation which I believe could be studied with advantage, particularly in its relationship to Central and Southern Queensland conditions.

It has been pointed out that the months from August to December cover the critical period in the growth of the crop. A crop that receives a good start in life will finish well, except under unusual circumstances. Therefore, we should aim at starting off the crop under the best of conditions. We have seen that a 30-ton cane crop requires about 36 acre-inches of water during its growing period, and in the districts named we cannot, in general, expect that amount of moisture to be absorbed by the soil during the growing season, and used by the crop. Hence it would be advantageous if we could store up a supply of soil moisture in advance of the planting season, to carry the crop through the dry spring months. It will, then, be necessary to prepare our land in advance of the wet season. When the last ratoon crop has been harvested the old stubble should be ploughed out immediately, and the surface of the land thoroughly disced. This will create a good surface mulch and chop up the trash and other crop residues to some extent. A good deep ploughing will then turn under the vegetable matter, and give it a chance to decompose completely before planting time. The presence of the loose surface layer of soil will ensure good contact with the substratum. Any weed seeds present at this time will probably be destroyed if buried deeply, or on germination subsequent surface discing will control them.

Where the subsoil is compact or a hardpan exists, the use of the subsoil plough should follow. The discs and harrows will help to reduce the clods of soil, and the roller may also be used to advantage for this purpose, as well as to destroy large air spaces, which will later hamper capillary rise of moisture. Conditions should then be favourable for the absorption of the rain which falls during January, February, and

March, and the deep tillage will assist materially in preventing waterlogging of many soils with imperfect drainage. Some of the Mackay soils are of this nature, due to the presence of an impervious hardpan at a depth of from 10-14 inches.

Such a fallow will generally do much towards mellowing the soil structure, particularly in the case of heavy soils. After periods of rainfall the surface of the land should be disced to break up the caked surface, and also to control weed growth. At the conclusion of the wet season the land should require a minimum of working to put it in condition for early planting. In planting at this time, when the soil is still warm, the sets will germinate readily, and the crop will become established before the advent of the winter months. Should a dry period follow, the crop roots will penetrate freely into the subsoil, and follow up the moisture supply which has been stored there. Instead of a shallow-rooted crop, then, we will have one which can draw its moisture from the full depth of soil and subsoil, and which will stand up well to droughty conditions.

Other things being equal, it will be found that a good ratoon crop follows more frequently on a good than on a poor plant crop; for the heavier growth of stubble produced by the plant crop ensures a better start for the ratoons. Hence, by providing conditions favourable for the plant, we are automatically assisting the ratoons. The latter get their start in life at a time when the rainfall is generally scanty. Therefore it is desirable that they should make best use of any moisture which remains in the soil at the time of harvesting the mature cane.

We have seen that the best way to conserve soil moisture is to break the soil capillaries by creating a surface mulch of loose soil. In this regard, the discs are again of great value. They should be drawn across the field—preferably in two directions at right angles—as soon as the trash has been burnt off after harvesting. Besides providing a surface mulch, they tend to destroy the uppermost "eyes" of the stool, and encourage the ratoon shoots to come from below. In this way the stool is kept well in the ground, and the shoot roots which then develop will have access to any available soil moisture.

The advisability of ploughing away from the stools in ratooning is one which can be decided only after a study of the local conditions at the time. If the soil is packed and dry, and would break up into clods which could not be worked down to a good tilth, it is probable that ill-effects would follow in the event of a subsequent dry spell. If, on the other hand, moisture conditions are favourable, ploughing away is highly beneficial. It removes a mass of old roots and dead portions of the stool, and on working the soil back again a mellow bed is again provided for the development of the new roots. Incidentally, such a furrow as is produced in this way is ideal for receiving the application of fertilizer which the ratoons will need, and the earlier they receive it the better use they will make of it.

WIRE-NETTING FOR THE ROAD.

When going over paddocks with car or truck in wet weather, take a small roll of wire-netting along. When negotiating muddy places lay the wire-netting in position. It enables the wheels to grip firmly, thereby saving time and temper, a lot of which is often lost when chains have to be put on. It is also useful on roads where there are only small sections in a bad state, as it is light and easily handled.

PYRETHRUM CULTURE AS A SIDE LINE.

The value of Pyrethrum flowers as an insecticide has long been recognised, and the varieties grown in Dalmatia and the east coast of the Adriatic Sea are of greater toxic value than other species grown elsewhere. Cultivation of the Dalmatian variety was begun in Japan in the 'nineties, since which time Japan has supplied the major part of the world's demand.

Pyrethrum flowers form the base of many insecticides used in medical entomology, but the discovery of recent years of the toxic principle—namely, the Pyrethrins—has led to the manufacture of a water soluble extract of Pyrethrum, commercially cheaper, and for which, it is anticipated, there will be a big demand in the near future. This extract of Pyrethrum is of particular value for agricultural use against caterpillars, ants, cucumber beetles, cut worms, leaf hoppers, and other agricultural pests. The insecticide first paralyses and then kills, causing no damage of any sort to the host plant; this is of special value in such sprays. Poisonous sprays have been responsible for loss of life and the confiscation of many tons of edible products rendered thereby unfit for human consumption. This is all avoided by the use of Pyrethrum products.

In view of the possibility of steadily increasing demands, it is hoped that Australia will not be found wanting in an endeavour to grow Pyrethrum flowers and supply some of the world's markets. If a Pyrethrum industry could be developed here in Queensland, what a wonderful boon it would be to struggling agriculturists, and in view of such possibilities I trust that this matter will receive, from prospective growers every possible consideration.—R. HAMLYN-HARRIS, City Entomologist.

QUEENSLAND WEEDS.

WHITE ROOT (*LOBELIA PURPURASCENS*)

By C. T. WHITE, Government Botanist.

Description.—A creeping herb from a few inches to a foot high according to situation, and possessing numerous white underground runners (stolons). Stems very slender. Leaves ovate or ovate-lanceolate in outline, margins toothed, ½ to 1 inch long, ¼ to nearly ½ inch wide, often purplish underneath. Flowers white on very slender stalks, as long as or more often considerably longer than the leaves and recurved as the ovary develops into the fruit; corolla white, 5-lobed, the three lower lobes much longer than the two upper ones. Fruit globose about ¼ inch in diameter when fully developed; seeds numerous, very small and covered with short hair.

Distribution.—A native of the eastern States of Australia.

Common Name.—White Root is the only local name I have heard applied to this plant.

Botanical Name.—*Lobelia,* after Matthias de L'Obel (1538-1616), an early Flemish botanist; *purpurascens,* Latin referring to the leaves often being purplish beneath.

Properties.—The genus *Lobelia* is a large one and is known to possess several poisonous species. Bailey (Weeds and Suspected Poisonous Plants of Queensland) records it as very poisonous to stock. Generally speaking, stock do not seem to eat the plant, or at least not to any extent. Cases have been reported to me of pigs having become sick after eating the white underground runners.

Eradication.—The weed is a pest very difficult of eradication and control in cultivated land, particularly in pineapple plantations. The white underground roots enable the plant to get among the pineapples where its eradication is almost impossible. The underground parts multiply to such an extent as to rob the surrounding soil of much moisture and plant food, with the result that the pineapple plants cannot thrive. With ordinary cultivation every little piece of the plant broken off forms a fresh plant by itself. The object with weeds such as this must always be to regularly check the green growth above the ground so that the underground parts must eventually become exhausted by repeatedly sending up fresh shoots and getting no nourishment in return. After cultivation as many of the white roots as possible should be raked out and destroyed. No experiments regarding eradication by sprays have been carried out, but, generally speaking, with plants with underground means of propagation such as this sprays are not very satisfactory and render the ground sterile for some time.

Plate 62.—White Root (*Lobelia Purpurascens*).
1. Plant, natural size. 2. Flower, enlarged.

CLIMATOLOGICAL TABLE—JULY, 1931.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	30·03	80	66	83	20, 27	54	9	43	5
Herberton	..	73	47	81	9	34	8	50	6
Rockhampton	30·11	76	51	84	26	41	9	43	6
Brisbane	30·11	69	50	81	28	42	17	178	6
Darling Downs.									
Dalby	30·14	66	39	82	26	28	14, 17	96	6
Stanthorpe	..	58	34	71	26, 27	21	30	195	7
Toowoomba	..	60	40	78	26	28	15	242	7
Mid-Interior.									
Georgetown	30·02	84	53	90	24	40	7	0	..
Longreach	30·12	74	42	87	25	31	7	0	..
Mitchell	30·16	65	37	82	25, 26	26	17	106	3
Western.									
Burketown	30·06	82	55	90	28	43	8	0	..
Boulia	30·12	75	45	92	25	35	7	0	..
Thargomindah	30·14	63	43	82	25	32	31	56	3

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1931 AND 1930 FOR COMPARISON.

Divisions and Stations.	Average Rainfall. July.	No. of Years' Records.	Total Rainfall. July. 1931.	July. 1930.	Divisions and Stations.	Average Rainfall. July.	No. of Years' Records.	Total Rainfall. July. 1931.	July. 1930.
North Coast.	In.		In.	In.	*South Coast—continued:*	In.		In.	In.
Atherton	1·01	30	0·42	1·89	Kilkivan	1·61	52	1·02	1·40
Cairns	1·59	49	1·27	2·95	Maryborough ..	1·86	59	0·81	0·96
Cardwell	1·36	59	0·55	1·29	Nambour ..	2·67	35	1·50	1·60
Cooktown	0·99	55	0·43	0·99	Nanango	1·67	49	0·65	1·51
Herberton	0·79	44	0·50	1·16	Rockhampton ..	1·42	44	0·43	1·26
Ingham	1·50	39	1·11	1·09	Woodford	2·35	44	1·86	2·00
Innisfail	4·68	50	1·90	5·84					
Mossman Mill ..	1·27	18	1·01	0·70					
Townsville	0·62	60	0·08	0·31	*Darling Downs.*				
Central Coast.					Dalby	1·73	61	0·96	3·02
					Emu Vale	1·54	35	1·60	1·49
Ayr	0·69	44	0	0·18	Jimbour	1·55	43	0·84	1·60
Bowen	0·91	60	0·08	0·20	Miles	1·63	46	0·84	1·12
Charters Towers ..	0·63	49	0·01	0·08	Stanthorpe ..	2·03	58	1·95	1·93
Mackay	1·63	60	0·31	0·30	Toowoomba ..	2·03	59	2·42	2·55
Proserpine	1·38	28	0·68	3·10	Warwick	1·82	66	1·72	2·99
St. Lawrence ..	1·27	60	0·17	0·60					
					Maranoa.				
South Coast.					Roma	1·42	57	1·28	1·28
Biggenden ..	1·34	32	0·37	1·41					
Bundaberg	1·80	48	0·64	1·32					
Brisbane	2·22	80	1·78	1·25	*State Farms, &c.*				
Caboolture	2·14	44	1·60	1·56					
Childers	1·68	36	0·72	1·70	Bungeworgorai ..	1·32	17	1·24	0·90
Crohamhurst ..	2·88	38	1·64	3·33	Gatton College ..	1·42	36	2·21	0·96
Esk	1·97	44	1·51	2·43	Gindie	0·91	32	0·55	0·55
Gayndah	1·44	60	0·98	0·86	Hermitage ..	1·70	25	1·82	2·08
Gympie	2·13	61	0·78	1·54	Kairi	1·18	17	..	1·52
					Mackay Sugar Experiment Station	1·39	34	0·19	0·28

GEORGE G. BOND, Divisional Meteorologist.

DISEASES OF THE PIG.*

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

[*Continued from the July issue.*]

PART VI.

In the preparation of information dealing with Diseases of the Pig, an endeavour has been made to describe in the simplest language possible the various conditions, abnormal and otherwise, associated with the incidence or appearance of disease in swine. The suggested preventive measures and methods of treatment are such as may be successfully carried out by any careful farmer, excepting only in cases where the services of a qualified veterinarian are advised, and in these cases the best methods to follow will be suggested on the spot by the surgeon himself.

The pig is notoriously a bad patient and a difficult animal to handle when indisposed, hence great stress has been laid throughout this treatise on the necessity of preventive measures, for prevention is not only much better than cure, but is invariably less costly and a great deal more satisfactory.

In dealing with methods of treatment and the engagement of qualified aid, it has been realised there are numerous difficulties in the way, because Departmental officers or practising veterinarians are not always immediately available in town or country districts. Again, therefore, we stress that prevention is better than cure, and we might even qualify this further by adding prevention is more necessary than cure.

Mr. Shelton's bulletin, representing as it does much labour and the fruits of careful study and observation, is a welcome contribution to current pig literature.—EDITOR.

DIARRHŒA OR WHITE SCOUR IN YOUNG PIGS.

OF all the troubles to which sucking pigs are subject, no ailment is more severe in its action, or more disastrous in its effect than Diarrhœa or, as it is more frequently referred to, White Scour. The disease referred to very often as Yellow Scour is of a similar, if not more serious nature. Answering an enquiry recently regarding the trouble referred to as "yellow scours" and which also is an acute trouble, Mr. C. J. Pound, Government Bacteriologist, stated that white and yellow scours are phases of the same trouble and are invariably caused by the Bacillus coli communis. The apparent variation in virulence of the infection is largely dependent upon the susceptibility of the individual attacked and the character of the environment. Diarrhœa in itself is not necessarily a disease, but is merely an affection of the bowels. The more persistent trouble, white scour, however, is classified as a disease and is often a premonitary symptom of disease involving organs other than the stomach and intestines.

* The typescript and illustrations of the Farmers' Bulletin on Diseases of the Pig have been submitted to the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., Department of Agriculture and Stock, Brisbane, Queensland.

Copies of the Bulletin when completed may be had gratis on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

In the compilation of this paper the writings of recognised authorities in other States and other parts of the world have been drawn on, and the assistance thus received, also that freely given by other Departmental officers, is acknowledged gratefully.

The Food Supply at Fault.

It is well to note that, when a sow farrows she has an ample supply of milk (or she should have if she is in normal condition) for her progeny, and they soon reduce her normal supply; but some breeders, in their enthusiasm, and with a desire to give her a good time both before and after farrowing, immediately increase her food supply and keep her trough well filled. Under this treatment the sow likewise becomes enthusiastic and produces heavier supplies of milk; consequently the young pigs get more than is good for them or is

PLATE 63 (Fig. 1).

This sow and litter, bred by a well-known Queenslander, Mr. H. Franke, of Cawdor, and owned by Mr. K. P. O'Brien, of Highfields, indicates that, where proper care and attention is given to the sow prior to, and to sow and litter after the birth of the pigs, excellent results may be obtained. These young pigs are active and vigorous, and live in clean, healthy surroundings where freedom from disease is a special feature. This sow has produced and reared litters of 12, 11, and 10, every litter being even in size and very healthy.

necessary, and as their digestive organs cannot effectively deal with the extra supply, stomach and bowel disorders are immediately set up and these are generally accompanied by indigestion and later by inflammation of the stomach and intestines. The pigs then sicken and a feverish condition follows; the bowels refuse to act properly and grey coloured, evil smelling, profuse diarrhœa follows. The young pigs do not immediately lose their appetites, but their condition gradually grows worse, and they begin to die off. The owner frequently thinks they are dying of starvation, and continues to force the sow with food so that she will produce more milk. The sow thus becomes overburdened with milk and as the suckers gradually drop away from her she cannot get rid of it; inflammation of her udders follows and she also sickens, and will probably suffer to such an extent as to lose her supply of milk altogether.

It is necessary to remember that the stomach of the young pig is very small and it requires small quantities of food only and at frequent intervals. They are, however, easily overdone and treating them is a difficult matter. To prevent trouble note that the sow should not be fed during the day she farrows; give her a thin gruel only about eight or ten hours after farrowing and very gradually increase her supply after the suckers are born and until they are a week or ten days old. She must have a supply of succulent green food, and be given regular exercise and when the pigs are ten days old they may be allowed to move about more freely and become accustomed to following the sow about. If, after all due care is taken to prevent the appearance of white scour in successive litters, it should occur and not readily yield to treatment, it would be better to seek veterinary aid, for the trouble may be due to infection, or indicate the incidence of other diseases more difficult of control or treatment. Parasitic infection

Plate 64 (Fig. 2).

Bottle-fed pigs are more subject to diarrhœa than those reared by the sow and they are more difficult to treat, hence special care is essential when it becomes necessary to hand feed them. Given proper treatment, however, pigs fed in the way illustrated in this picture do very well.

is also liable to set up bowel disorders even in pigs not yet weaned, while exposure to the vagaries of the weather and especially to cold winds and rain also act as premonitary causes. In the more fatal diseases of the pig in which the respiratory organs are involved (swine pneumonia) and in swine fever and other diseases not prevalent in Australia, diarrhœa is invariably present, and has a weakening effect.

Procedure to Follow.

Prevention, or immediate control always being better and more satisfactory than cure, it would be wise immediately there is any sign of scouring in one or more of the young pigs to reduce the sow's food supply by half; compel her and the suckers to take exercise, give castor oil in the food as advised; move the sow and suckers to a clean, dry pen, and feed the sow very lightly for a few days. If the ailment

persists, give the sow a second dose of oil; give each of the suckers teaspoonful doses of castor oil on the first day, and again on the next day if still scouring; sprinkle the floors and yards lightly with air-slaked lime, and keep them scrupulously clean; add a cupful of lime water to the sows food every day, and be careful, not only to use sweet clean food, but also to place it in a clean food trough in a clean pen. Later, when the young pigs begin to feed on their own, give them some lime-water too; it does them no harm as long as it is not used too freely. The lime-water is readily prepared by taking a tub or barrel, cleaning it out thoroughly, and soaking in clean water for a day or two. Then half fill with clean rain water and put about half a bucketful of air-slaked lime in the barrel and after stirring water and lime together allow this to settle for several hours. It will be

PLATE 65 (Fig. 3).

Mrs. Percy Campbell takes a hand at feeding the orphans. It is scenes like this (and in Fig. 2) that illustrate the intelligent interest Queensland women-folk have in farm affairs. A little extra care and attention means much in matters of this description.

noticed that a thin scum floats on the surface and that the water is as clear as crystal. As long as this scum forms daily, the lime-water is good, and the barrel can be refilled after use. Stir the lime up occasionally and it will be good for two or three weeks at least. When the scum fails to appear on the surface, clean the barrel out, and start again with a fresh supply of lime and water. Never use an iron or tin container for this purpose.

Cleanliness is next to godliness in all matters relating to pig management. Common sense methods of feeding and care are also golden rules, and a knowledge of the cause and effects of the common diseases to which stock are subject will be of the greatest value at all times.

Boiled Rice as a Remedy for White Scour.

Boiled rice has been used with some success in the feeding of pigs suffering from this trouble as also the water in which rice has been boiled, barley water or gruel made up of milk and flour fed warm, may also be given. In the case of very young pigs a dessertspoonful of warm rice water two or three times a day will suffice; it must be given in teaspoonful doses as a drench, and the suckers should be kept away from the sow for at least two hours after dosing. Suckers that still have a good appetite should be given both boiled rice and the rice water or barley water or gruel and no other food should be allowed while this is being given.

In severe cases try the addition of half an ounce of prepared chalk to the food of the suckling sow. The addition of cod-liver oil and a small quantity of bicarbonate of soda may also be helpful, especially if the suckers must be hand reared.

The following have been compiled as "Golden Rules" for the breeder who wishes to ward off attacks of diarrhœa and other troubles in his pigs:—

(1) Do not feed the sow immediately before or after farrowing, and feed very lightly during the first ten days she is rearing her litter. Allow plenty of clean drinking water, green food, charcoal, and other mineral matters.

(2) Do not feed sour, decomposed, or musty foods to pigs, and be careful also to keep musty, mouldy bedding out of the sow's sleeping quarters.

(3) Avoid changing the sow's food while she is suckling her litter. If a change becomes necessary, effect the change over gradually.

(4) Strictly avoid using insanitary feeding troughs and keeping pigs in unclean sties. Faulty construction of sties, badly drained yards, and exposure are all detrimental to the development of healthy pigs.

(5) Remember that improper feeding of the sow; digestive disturbances of the sow; bacterial contamination of the sties, food troughs, feeding and mixing buckets, contamination of the food by urine or fæces of other animals; cold, draughty sties, &c., all operate against your success.

(6) Strict cleanliness is essential. Immediate action on the appearance of disease means a great deal.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

ANNUAL PIG SCHOOL AT GATTON.

The fourth of a series of schools of instruction for farmers interested in pig raising, concluded at the Queensland Agricultural College at Gatton recently, proved to be the most successful yet held. Subjoined is a brief account of the activities of the school.

FARMERS attending the school were from the following districts:—Thornton and Oakey on the Downs; Wondai and Nanango in the South Burnett; Kilcoy, Eumundi, Gympie, Fairymead (Bundaberg), on the North Coast; Millaa Millaa on the Atherton Tableland; Longreach in the West; Ipswich, Kentville, and College nearer the metropolitan area; and Sydney, N.S.W.

Opportunity was taken, in the course of the school, to visit Murarrie (Co-operative) and Oxley (Foggitt Jones, Ltd.) bacon factories, the Stock Experiment Station, Yeerongpilly, and the Offices of the Department of Agriculture and Stock, Brisbane.

The consensus of opinion among those attending was that these schools of instruction are invaluable means of adding to practical knowledge on important points in animal husbandry, as well as acquiring new information on modern developments in the industry.

A comprehensive lecture list embraced all the subjects likely to interest the pig raiser seeking to improve his own industrial efficiency. The syllabus included

PLATE 66.—VISITING LECTURERS WITH MEMBERS OF THE 1931 PIG SCHOOL.

Front Row, *Left to Right.*—D. A. Bain (Longreach), J. E. Turpin (Forest Hill), E. S. Lewis (Ipswich), S. Burns (Wondai), S. H. Shelton (Gatton College), N. Diamond (Sydney, New South Wales).

Second Row, *Left to Right.*—J. F. F. Reid (Editor, "Queensland Agricultural Journal"), C. T. White (Government Botanist), W. B. Granville (Nanango), W. Murnane (Kybong), E. Rumball (Greenmount), H. Archibald (Oakey), E. J. Shelton (Senior Instructor in Pig Raising).

Back Row, *Left to Right.*—W. J. Hartley (Kilcoy), T. Mullin (Millaa Millaa), J. McBurney (Eumundi).

Absent from Group.—J. Sutton (Fairymead, Bundaberg).

PLATE 67.—A TOP RAIL ARGUMENT.

Members of the 1931 School of Instruction discussing pig points. Mr. Shelton, on the extreme right, is the referee.

PLATE 68.—YOUTH'S INQUIRING MIND.

The youngest member of the school absorbed in his examination of a pig's glands. Major Mackenzie is the demonstrator.

discourses on anatomy, breeds, animal husbandry in all its relative branches, selection of sites and designs and construction of piggeries, diseases and their treatment, market requirements, slaughtering and curing, plants poisonous to stock, school club work and rural economics.

The school was under the directorship of the Principal of the College, Professor J. K. Murray, with Mr. E. J. Shelton as Chief Instructor. The lecturers included members of the College staff and officers of the Department of Agriculture and Stock.

Pig Feeding Experiments.

The visit of the students to the Yeerongpilly Stock Experiment Station, where a series of pig-feeding experiments are being carried out, by direction of Mr. H. F. Walker, the Minister for Agriculture and Stock, was of particular value to them. The first results of those experiments are detailed in a very interesting report published in the last issue of the Journal.

The visit to the Department also had a highly instructional value, particularly in respect of the work the students saw in progress in the chemical and entomological laboratories. The extent and importance of scientific research as applied to agricultural problems in Queensland proved an eye-opener to the visitors, and they left impressed with the great value of the investigational work of the scientists engaged in dealing practically with many of the agricultural problems of the day.

PLATE 69.

Members of the 1931 Pig School en route to Bacon Factories to study modern methods of treatment of the Product.

QUEENSLAND SHOW DATES.

Imbil: 2nd and 3rd September.
Noosa: 9th and 10th September.
Enoggera: 12th September.
Beenleigh: 18th and 19th September.
Malanda: 23rd and 24th September.
Rocklea: 26th September.
Brisbane River Camp Draft: 25th and 26th September.
Kenilworth: 26th September.
Southport: 3rd October.
Nerang: 9th October.
Evelyn Tableland: 9th and 10th October.

TROPICAL FRUITS AND STRAWBERRIES.

HARVESTING, PACKING, AND MARKETING.

By JAS. H. GREGORY, Instructor in Fruit Packing.

GROWERS of many of our tropical fruits are anxious to improve their marketing, but are not sure of the correct method of obtaining the best results. A study of the following information should be of assistance:—

GENERAL HARVESTING CONDITIONS.

As in the case of other fruits, care is essential for the successful handling of tropical fruit. Climate and temperature when harvesting is in progress are big factors in the successful carriage of tropical fruits to local and distant markets. These fruits are of such a delicate nature that every care must be taken to cut out carelessness and rough handling. Care should be taken by growers to see that fruit after harvesting is allowed to cool before being packed. Close attention to this point is necessary if fruit is to be carried over long distances and is expected to be in a satisfactory condition when it arrives on the market. Fruit packed while in a heated condition holds the heat for a long period during transit, thus causing premature ripening or sweating, with the certainty of the consignment opening up in an over-ripe or wet and musty state, which is just the condition suitable for the development of moulds and transit rots. Fruit in this plight has only a short commercial life, and has to be sacrificed by the agent to distributing retailers for rapid disposal, usually necessitating a substantial reduction in price to ensure a quick sale. Such sales often have a detrimental effect on the price or the demand for sound consignments. By taking advantage of the time of the day, and picking the fruit while its condition is unheated, precooling is made considerably easier. If necessary, after picking, spread the fruit out in a cool place to reduce its temperature before packing. A flat-topped table with the surface covered with bags or other soft material is just the thing required for cooling, and is also a good sizing and packing bench.

PACKING THE PRODUCT.

Care in Making Cases.

Growers, after taking every care in handling their fruit while harvesting and packing, often, through carelessness in making and nailing down cases, offset an advantage already gained by careful handling. Careless nail-driving, causing nails to protrude inside the box from the timber of the case, often results in damaged fruit with consequent waste. Nail-marked fruit decays, breaks down, and affects adversely the sound fruit in the box. Nails protruding through the outside of a case are a danger to all handling it in transit, often causing bad cuts or loss of temper, and rough handling in consequence. Extra care in such matters is well worth while, and saves trouble.

The "Get Up" of the Package.

Attractiveness is the main feature to be studied, anything added or done to make the product worth more to the buyer is a big factor in quick sales and higher prices. The following points are well worthy of consideration:—

Use only clean, well-made cases. Second-hand cases often carry insects and fungus diseases.

Plain white or coloured paper is much more attractive and cleaner than news-print, while the extra cost is only a fraction of a penny.

Where it is necessary to use packing, clean woodwool is preferable to most types of grass and other packing.

Fancy labels are an improvement, but if using stencils or rubber-stamps care should be taken to apply them neatly and so avoid smudging and spoiling the appearance of the finished package. The packer's full name and address, with variety and contents of the case, as required by the Fruit and Vegetables Act, should be embodied in labels or stencils.

Wiring the case is an improvement. Often the wiring together of two small cases to make one package is an economy and an insurance against the rough handling of smaller packages. Wiring is also an attraction to the buyer who desires to despatch fruit to distant places.

CUSTARD APPLES.

Harvesting.

Picking custard apples at the right time is also essential in keeping buyers and consumers satisfied, besides helping in keeping up the demand. Custard apples picked too soon inevitably go black and become unsaleable and unattractive. The fruit should be picked when it is in a firm, mature condition to ensure good carrying and ripening qualities. A good indication of the correct time to harvest custard apples is when the interstices between the corrugations of the fruit have turned to a rich creamy colour. Fruit picked at this stage, if firm, will carry well and ripen excellently. Packing will present no difficulties if the operation of sizing and that of packing are carried out separately.

Sizing.

To obtain the best results when marketing custard apples, care should be taken to pack the fruit in the best possible manner for marketing. Clean, new cases, nicely stencilled with the packer's name and address and the number of fruit in the case, add to the market value of the product. Most custard apple growers consider it unnecessary to size and pack their fruit. Like all other fruits, when this is done the value is considerably raised, both from the seller's and buyer's point of view. Buyers do not like to purchase fruit of mixed sizes, as they have no means of arriving at what a case containing varying sizes is going to realise when sold at so much per individual fruit at prices varying according to the size. When a case is sized this return can easily be calculated, and a price paid accordingly. When a buyer cannot calculate the actual return he is likely to receive for a case of fruit, it is only to be expected that he will be careful to safeguard himself and pay a lower price than the fruit is actually worth.

Sizing is an operation that should be carried out in the shed before packing. An excellent sizing table is one with a flat top, covered with clean sacks, with a 3-inch high beading around the edge to stop the fruit from rolling off. For best results the operator should size by hand into at least four different heaps of fruit of approximately even dimensions. It is also advisable to clean the fruit by carefully brushing if its appearance is affected by Mealy Bug or other pests.

Packing.

By packing two different counts from each heap packers will size the fruit automatically into six or seven sizes. The best container is the dump half-bushel case, 18 inches by 7½ inches by 8⅝ inches. For the larger sized fruit, with the counts 8, 10, 12, and 14, the case is best made up in the narrow way—viz., 18 inches long by 7½ inches wide by 8⅝ inches deep (see Plate 70); but for the smaller sized fruit, with the counts 15, 18, and 21, the wide way, 18 inches long by 8⅝ inches wide by 7½ inches deep, will be found most satisfactory. (See Plate 71.)

Following are the packs and counts:—

NARROW CASE PACKS.

18 inches long by 7½ inches wide by 8⅝ inches deep.

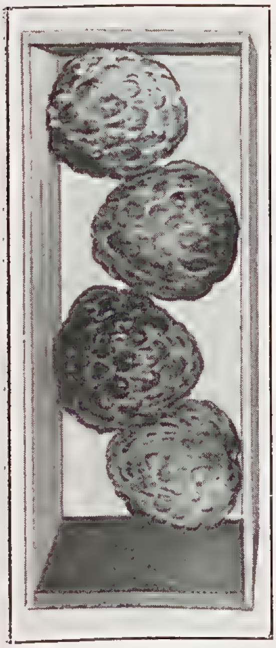
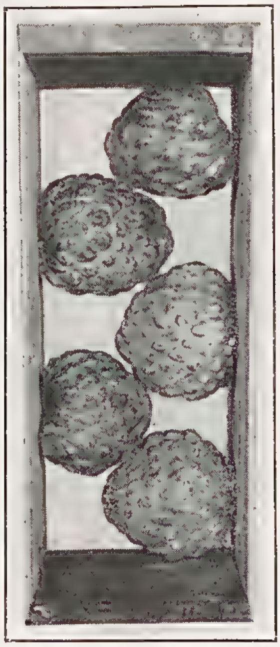
Pack.	No. in First Layer.	No. of Layers.	Total.
1 x 1	4	2	8
1 x 1	5	2	10
1 x 1	6	2	12
1 x 1	7	2	14

WIDE CASE PACKS.

18 inches long by 8⅝ inches wide by 7½ inches deep.

Pack.	No. in First Layer.	No. of Layers.	Total.
2 x 1	8	2	15
2 x 1	9	2	18
2 x 1	11	2	21

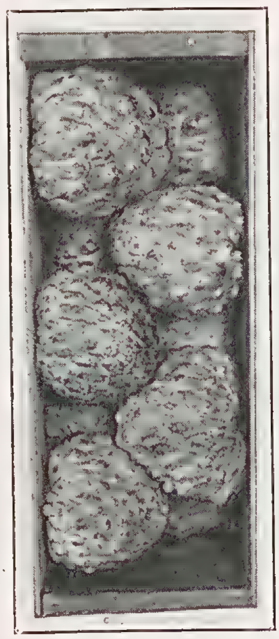
First Layer 1 x 1 Custard Apple Packs.


8 Count—1st. Layer. 10 Count—1st. Layer. 12 Count—1st. Layer.

Note the protection given to the soft points of the fruit.

Finished Cases.

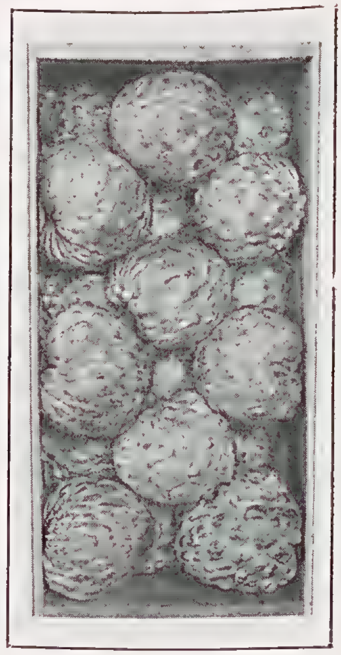

8 Count—Finished Case. 10 Count—Finished Case. 12 Count—Finished Case.

Plate 70.—Custard Apple Packing for the Local Market.

Large sizes. Australian Half Dump Case. Case made on narrow system 18″ long x 7$\frac{1}{8}$″ wide x 8$\frac{3}{8}$″ deep.

2 x 1 Custard Apple Packs.

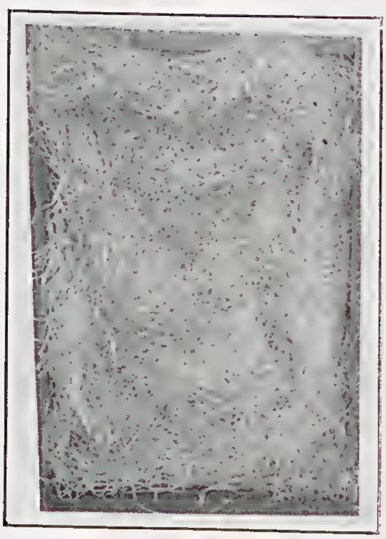
18 Count—1st. Layer.



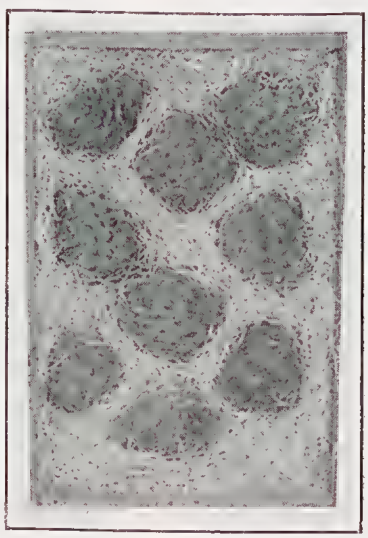
18 Count—Finished Case.

Note the protection given to the soft points of the fruit.

PLATE 71.—CUSTARD APPLE PACKING FOR THE LOCAL MARKET.
Small sized fruit. Case made on the wide system 18″ long x $8\frac{2}{3}$″ wide x $7\frac{1}{8}$″ deep.



Case prepared with woodwool for placing the Custard Apples on.



Finished Case with the top layer of woodwool removed. Note the padding between each fruit.

PLATE 72.—CUSTARD APPLE PACKING FOR EXPORT.

These packs and counts should pack any average sized line of custards, but growers with only a small quantity would possible not need to do all of these counts.

With very large fruit it is better to adopt a single layer tray of a suitable depth. For distant markets the single layer tray is the best container. Owing to the irregular shape of the fruit commonsense has to be used in getting the fruit to fit in snugly, careful selection of irregular-shaped fruit to match each other being a great help in obtaining a good pack. Force should not be used under any circumstances. A bigger latitude in sizing is necessary in handling custard apples than in handling fruit, such as citrus or tomatoes. Only a quarter of an inch variation is allowed in citrus and kindred fruits, but the variation in the sizes of custard apples will greatly exceed this according to the shape of the fruit. One of the main objects of packing is the protection that it gives the fruit, and growers when packing want to keep this object in view. As custard apples soften first at the point or opposite end to the stalk, the packer wants to keep foremost in his mind the placing of fruit to the best advantage to protect the parts which might soften first while in transit. By keeping the point of the fruit turned inwards from the wood of the box the maximum amount of protection is obtained from bumps and vibration during handling and in transit. A study of the illustrations will help to explain this.

If a packer happens to use other counts and packs than those given here, a close attention to the protection of the fruit will be of assistance in good transit and satisfactory condition on arrival at the markets. Cases should be packed high enough above the top of the box to allow a slight pressure to be placed upon the fruit by the lid when nailed down. Care should be taken that there is no loose fruit in the case as the constant rattling and vibration in transit will soon render the fruit unfit for sale. It is well to remember that one broken custard apple will often make a mess of the whole consignment.

Packing for Export.

For long distance transit the best container is the single layer—half-bushel standard, 18 inches long by 11½ inches wide by 5¼ inches deep—tray with the fruit nested or padded in woodwool. (See Plate 72.) The tray is first prepared by placing a layer of woodwool on the bottom and around the ends and sides. The fruit is then placed in position in a single layer with a small space between each fruit. It is advisable not to wrap custards when sending long distances, as it hastens the process of ripening. Woodwool is then placed in the spaces between the fruit to form a small pad for each fruit, and a layer is spread on the top of the pack and the case nailed down. The whole case should be packed so that it will not rattle when shaken gently. Fruit packed in this manner carried to Tasmania for show purposes, and although soft on arrival was exhibited for three days, and was then still in good eating condition. Fruit packed without woodwool in the same type of container was unfit for consumption on arrival at the show. Care should be taken that no fruit projects above the top of the tray before nailing down. Two trays wired together make a handy package for transport over long distances. No difficulties in marketing should be experienced by growers if judgment and commonsense are used in handling these fruits.

PAPAW PACKING FOR DISTANT MARKETS.

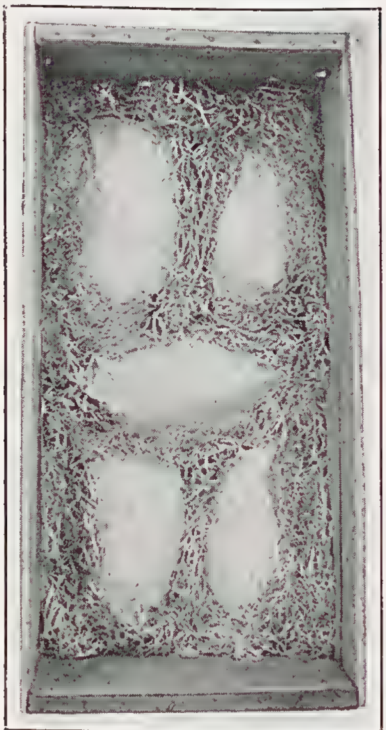
Sizing.

In packing papaws the foremost idea in the mind should be the best method of giving the maximum protection to the fruit in transit, and the packing of the fruit so that it will display to the best advantage when exposed for sale. Before being packed the fruit should be cooled and sized. To assist in making the operation of packing easier, it is a great help to endeavour to match the various-shaped papaws whilst sizing them into heaps. Four sizes should be sufficient to cover the packing of papaws for export. As with custard apples, sizing is easily done on a flat-topped table covered with soft bags or other suitable material. Many growers do not think it necessary to go to this trouble, failing to appreciate that the skin of the papaw is exceptionally tender, and that the slightest scratch will cause the fruit to bleed, thus damaging the appearance of the fruit.

Packing.

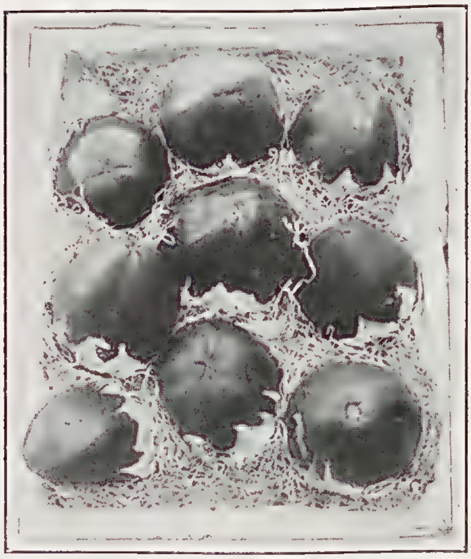
The best container for long-distance carriage of papaws is the tropical fruit case, 24¾ inches long by 12 inches wide by 12 inches deep. (See Plate 73.) Woodwool is the most satisfactory packing. The box is prepared by placing a layer of woodwool on the bottom of the case and around the ends and the sides. Each papaw is then wrapped in

soft paper and placed in a single layer in the prepared box, using small pads of woodwool to make individual fruit firm and snug. A thin layer of woodwool is then placed over the top of the fruit, and the process is repeated until the case is full, finishing off with a layer of woodwool packing on the top. It is unwise to have the fruit projecting too far above the top of the box, but the lid of the case should press just firmly enough to keep the fruit snug and firm. Packers should avoid placing too much padding in the case. Care in matching the various-shaped fruit will greatly assist in this. By using a coloured wrapper in conjunction with the woodwool a very attractive package can be placed on the market. Care in eliminating all green, over-ripe, or diseased fruit when packing is absolutely necessary to ensure safe transit and satisfaction to buyers.



Packed in Tropical Fruit Case 24¾″ x 12″ x 12″. Fruit wrapped in soft paper and nested in woodwool.

PLATE 73.—PAPAWS PACKED FOR EXPORT.



Packed in the Dump Case used as a tray by removing the side; 18″ long x 14¼″ wide x 8⅜″ deep. Note the woodwool padding between the fruit.

PLATE 74.—PAPAWS PACKED FOR LOCAL MARKET.

Packing for Local Markets.

Growers who are near enough to their markets to be able to use motor transport have a decided advantage over those who have to send over long distances. The fruit can be left on the tree to become almost fully ripe before sending to market, and it is not necessary to pack in the same manner as when sending farther afield. Close attention should be paid to the elimination of all disease-infected or marked fruit, and sizing should also be rigidly adhered to. The Australian dump case, made in the form of a tray 18 inches long by 14¼ inches wide by 8⅜ inches deep, is a good container for the local market (Plate 74). The fruit is packed on end in a single layer resting on a layer of woodwool or similar packing. As a protection against rubbing the bottom end of each fruit, it should be wrapped for about two-thirds of the way up in clean white or coloured paper, while each fruit is made snug and tight by pushing pads of woodwool in between each fruit. Papaws packed in this way have a very attractive display value, and sell much more readily than those carelessly placed in cases without packing, the buyer being able to appreciate the quantity and quality at a glance.

MONSTERIA DELICIOSA.

Packing for Distant Markets.

This is a fruit that is not as well known out of Queensland to the extent that one would think. Many people at the Hobart Exhibition tasting the monsteria for the first time were favourably impressed, and were keen to know where supplies could be secured. Many specimens of this fruit bought by people did not come up to expectations through being immature, growers being afraid to allow the fruit to stay long enough on the plant on account of its tendency to fall to pieces when ripening. This can be overcome by harvesting at a later date and, when packing, winding a strip of paper around the fruit to prevent the outside shell from falling as the fruit ripens. Fruit packed like this ripened over its entire length, and still retained its full flavour when being consumed three weeks after being harvested in Queensland, having in that period travelled from Queensland to Hobart and back to Melbourne. The standard half-bushel case, 18 inches long by 11½ inches wide by 5¼ inches deep, is an ideal case for the monsteria. The fruit is packed in layers and made snug by placing a thin layer of woodwool on the top and bottom and between the layers. Lining the case with clean white or coloured paper is an added improvement to the appearance of the case.

PACKING STRAWBERRIES.

Containers.

Many containers are used for marketing strawberries. In some of the Southern States a punnet is in general use, but as this container has the disadvantage of containing more than one layer of berries with each layer resting upon the other, it is not as good a container as the single layer packed boxes in general use in Queensland. There are two types of boxes in use—one which measures 8 inches long by 4 inches wide by 1¼ inch deep, and the other 24 inches long by 8 inches wide by 1½ inch deep, measured clear of a central partition which it has. The smaller of the two containers is preferable, because it gives less latitude for mistakes and spoiling the appearance and alignment of the fruit when packing. Being smaller, it will not give the fruit as much play to become loose in the box through careless handling, so causing damage through rubbing and otherwise. It is also a better container for retailing, the larger box or tray, which contains the equivalent of six smaller boxes, holding too much fruit for the average buyer, necessitating repacking into smaller boxes. As the strawberry is such a soft fruit, it is necessary to handle it as little as possible. The smaller container also has the advantage of allowing better sizing and packing when the supply of fruit on the farm is short for marketing. Twenty of the boxes 8 inches by 4 inches by 1¼ inch will just fit comfortably into a half-dump case.

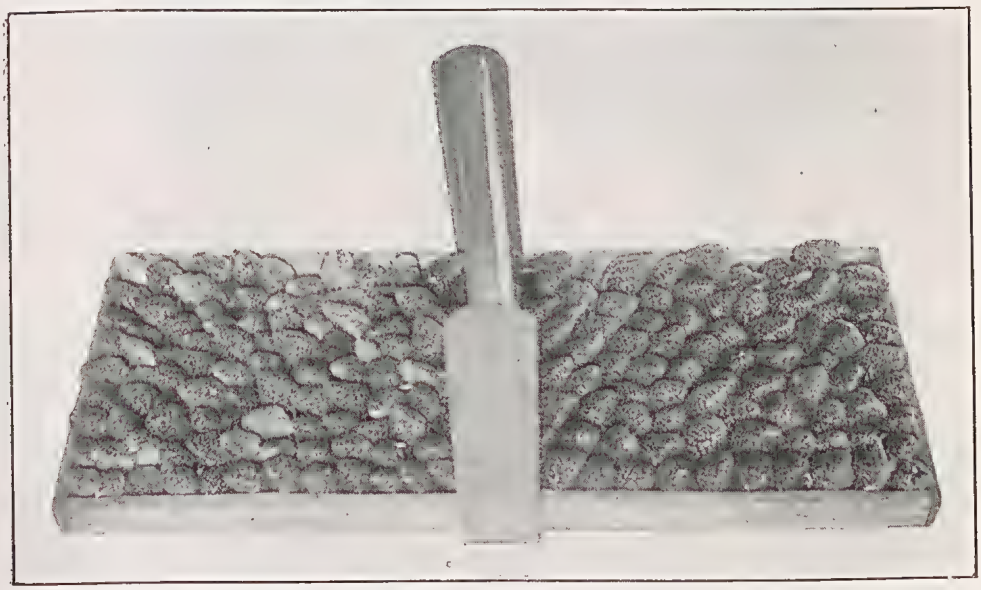


PLATE 75.—PICKING TRAY FILLED WITH FRUIT.

Note the Different Grades and Colour of Fruit that are placed at either end of the Tray when picking.

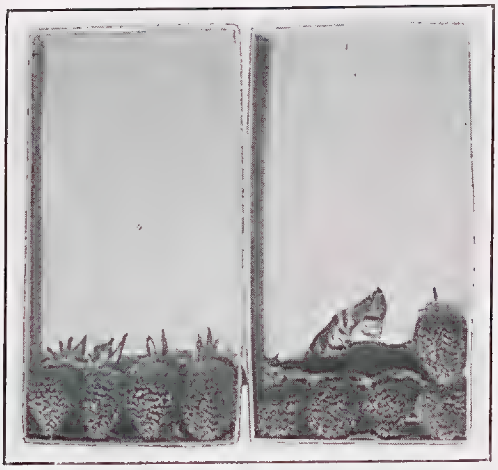
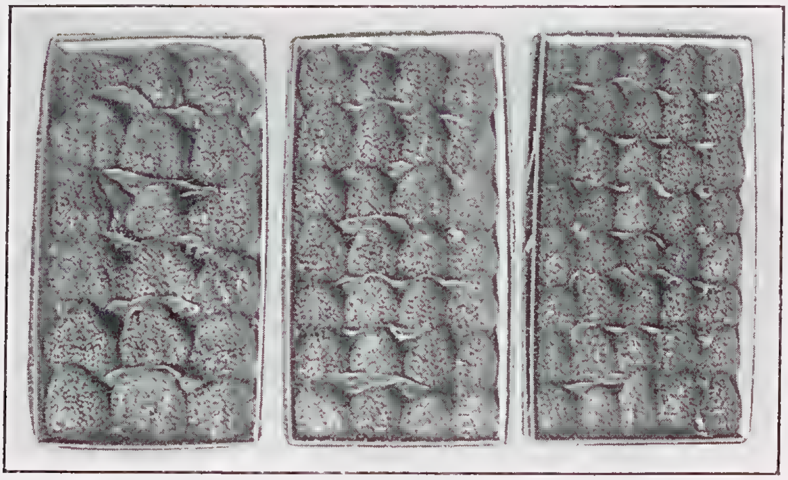


PLATE 76.—METHOD OF STARTING TO PACK.
Note the placing of the leaves to separate the fruit.



Threes. Fours. Fives.
PLATE 77.—FINISHED BOXES.
Note the alignment of the fruit in each box. Also the placing of the leaves between each row of fruit.

Handling.

Unlike other fruits, the strawberry does not necessitate a large, complicated, costly equipment in the packing-house to size and grade. This is done by hand, and much labour can be saved by grading while picking. Sizing is best done in the packing-house.

A good picking container is a tray with a handle. (See Plate 75.) When picking, the first-class berries fit for marketing can be placed at one end of the tray, and second-class or factory berries placed at the other. By doing this the berries are automatically graded. Berries are packed for market in three sizes—threes, fours, and fives. Sizing is done while packing, the packer having a box for each size. Women and girls usually make the best berry packers, having as a general rule a lightness of touch which is often lacking in the case of men operatives. Berries with grains of earth adhering to them, as is often the case after rain, should be gently brushed. This can be done by placing a soft lacquer brush as a fixture, standing upright in the bench, and by taking the berry by the stalk and gently running it through the bristles of the brush.

Packing.

The method of packing is simple enough. The box is first prepared by placing a prepared leaf across the end of the box—passion fruit leaves are very suitable, while fern leaves are sometimes used where passion fruit leaves are not available—with the leaf projecting high enough to reach to the top of the box, and at the same time being bent enough to place thereon the first line of berries—threes, fours, or fives, according to size. The berries should be placed on their stalk ends with the points up, allowing the point of the fruit to reach to the level of the top of the box. (See Plate 76.) Another prepared leaf is then placed in the box, bent so as to rest on the bottom of the box to have the next line of berries placed thereon, while the remainder of the leaf rests against the first line of berries and acts as a separator of the lines of fruit. This process is repeated until the box is filled. (See Plate 77.) For travelling a layer of leaves placed on top of the finished pack is an assistance.

Points to be watched are—

See that the fruit is placed so that it will come as near as possible to the top of the box, and it will then keep snug when the lid is placed in position.

Avoid packing too high.

Keep the alignment of the fruit straight both across the box and from one end to the other. (See illustrations of packed boxes.)

Avoid placing too large pieces of packing leaves between the berries.

See that the berries do not rattle in the box after the lid is placed in position.

Keep all badly-coloured berries out of the box, as they spoil the commercial appearance of the package when displayed for sale.

On no account pack damaged berries, no matter how slight—they spoil the keeping qualities of the box. One bad berry soon makes a whole boxful practically unsaleable.

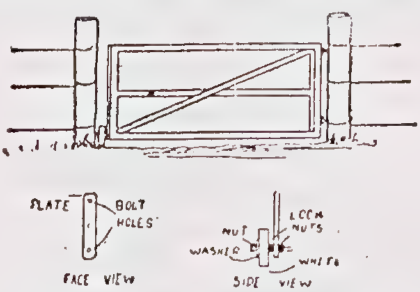
It is recommended that growers should stamp the pack of the fruit on the lid of each box, so that when being sold the seller can see at a glance whether they are threes, fours, or fives without having to remove the lids. This would be in addition to the name and address of packer required by law in letters $\frac{3}{16}$ inch at least in height to be stamped on the top of the lid and the end of the box. Use rubber stamps, as they are quick in application and make a finished job. When sending away packed in cases, see that stencilling is done neatly and free from edge of the stencil plate smudges.

ACKNOWLEDGMENT.

Thanks are due to Mr. Beckley, of Wellington Point; Mr. Chataway, of Raby Bay; and Mr. McLeod, of Brookfield, for their assistance in making available the fruit necessary to provide the illustrations in this article.

WHEEL SUPPORT FOR GATE.

When the average gate is being erected insufficient clearance is given, with the result that in time the gate drags. To overcome this defect when it is evident, is a simple matter. Proceed as follows:—Get a small iron plate, drill three holes in it, the two to be used for bolting on to the gate member, and the lower one to be used for the wheel. A bolt is passed through the lower hole of plate with a lock-nut



on either side to keep both secure. Then a small plough or similar wheel is put on the bolt, and secured by the other nut on the free end of bolt. This prevents the gate from sagging, and permits of it being easily opened and closed, the weight of the gate being borne by the wheel, which is in contact with the earth.

This device can be easily and readily made out of old material.

DEVELOPMENT OF TOBACCO GROWING.

Mr. H. F. Walker (Minister for Agriculture) announced recently that plans of the Government for the development of tobacco growing do not include a scheme whereby an advance of £5 will be made to every farmer around Brisbane who grows at least one-quarter acre of approved tobacco, or that tobacco leaf produced by growers of small areas will be flue-cured by the Government irrespective of its place of origin.

The Government is keenly alive to the possibilities of establishing a valuable tobacco-growing industry in Queensland, but its development must take place along sound lines, and every element of unnecessary risk must be eliminated as far as it is possible to do so.

With the possibility of building up a permanent industry to take advantage of the assured market in Australia, consideration has to be given to the preservation of the reputation already established for Queensland bright tobacco, and to the protection of prospective growers who, owing to the necessity for a considerable outlay of capital for the commercial production of bright, flue-cured tobacco leaf under modern conditions, might be involved in financial losses if large-scale attempts were made under unsuitable conditions of soil and climate.

The Government already is in possession of valuable data available for the guidance of growers as a result of experiments carried out in conjunction with the Australian Tobacco Investigation at Mareeba, Sarina, Rockhampton, and Miriam Vale.

There are other districts outside of the recognised tobacco-growing areas where, quite possibly, conditions of soil and climate would be suitable for tobacco growing, but they can only be determined definitely by experiment. The Government is conscious of the fact that farmers in many localities are eager to try the crop, owing to the exceptionally low prices ruling for many other farm products, and that they need some guidance as to the suitability or otherwise of their district. Consequently it has been decided that the Queensland Government will carry out experimental trials in six districts—namely, Collinsville (Bowen), Byfield (Rockhampton), Bundaberg, Maryborough, Beerburrum, and Amiens (Stanthorpe).

One trial plot will be established in each district on a location to be selected by the Department of Agriculture and Stock, a local farmer being asked to co-operate with the department in carrying out the trial.

Additionally, a tobacco flue-curing barn will be erected in the precincts of the Department in Brisbane for the curing of leaf grown on the experimental plots.

The proposed extension of tobacco experimental and instructional work to the Southern Division of the State will necessitate a rearrangement of the instructional staff of the Department, including the transfer to Brisbane of an officer at present stationed in North Queensland, who is experienced in tobacco cultivation and flue curing.

APPLES FOR THE KING.

The Minister for Agriculture and Stock (Mr. H. F. Walker) referred recently in terms of appreciation to the enterprise of the Summit Fruitgrowers' Co-operative Association, Limited, in arranging, through the Agent-General for Queensland (Sir E. H. Macartney) for the presentation to His Majesty the King of a case of apples from the Stanthorpe district. This case formed part of a first shipment of deciduous fruit consigned to the home markets from the Stanthorpe district, and was shipped by the R.M.S. "Cathay," which arrived in London in May last.

The Agent-General, through the Secretary of State for the Dominions, secured the consent of His Majesty to the acceptance at Buckingham Palace of a case of apples known as the "Granny Smith" variety. The Secretary of State later conveyed to the Agent-General an expression of His Majesty's best thanks to the donors and to the Government of Queensland, with his best wishes for the success of the Queensland fruit industry.

Advices indicate that the whole consignment arrived in perfect condition, well packed, and drew appreciative comments from buyers. Prices realised ranged from 13s. to 18s., which compared favourably with those obtained from consignments of a similar class of fruit from other sources.

Mr. Walker desired to congratulate the association on their enterprise in initiating an export trade in Queensland apples, and trusted that the financial success of this consignment would prove sufficient encouragement to warrant exports next season on a larger scale.

PLATE 78.—VICE-REGAL VISITORS TO THE 1931 BRISBANE SHOW.

In the group are Their Excellencies the Governor-General, Sir Isaac Isaacs, and Lady Isaacs; the Governor of Queensland, Sir John Goodwin, and Lady Goodwin; and Messrs. W. A. Affleck (President), P. J. Symes, and H. W. Watson (Secretary), of the Royal National Agricultural and Industrial Association.

PLATE 79.

The Governor-General, Sir Isaac Isaacs, and the Chief Justice of Queensland, Sir James Blair, were among the ringside throng at the Brisbane Show.

The Governor, Sir John Goodwin, Lady Goodwin, and the Premier, Hon. A. E. Moore, and Mrs. Moore, were also among the notable visitors to the Brisbane Show.

PLATE 80.

Winning District Exhibit, A Grade, at the 1931 Brisbane Show, from the North Coast and Tablelands of New South Wales.

PLATE 81.
The Winning District Exhibit in B Grade, Brisbane Show, from Mount Larcom, Central Queensland.

Plate 82.

The Winning "One Man Farm" Exhibit at the Brisbane Show. Grown, made, and displayed by J. Beck, of Stanwell.

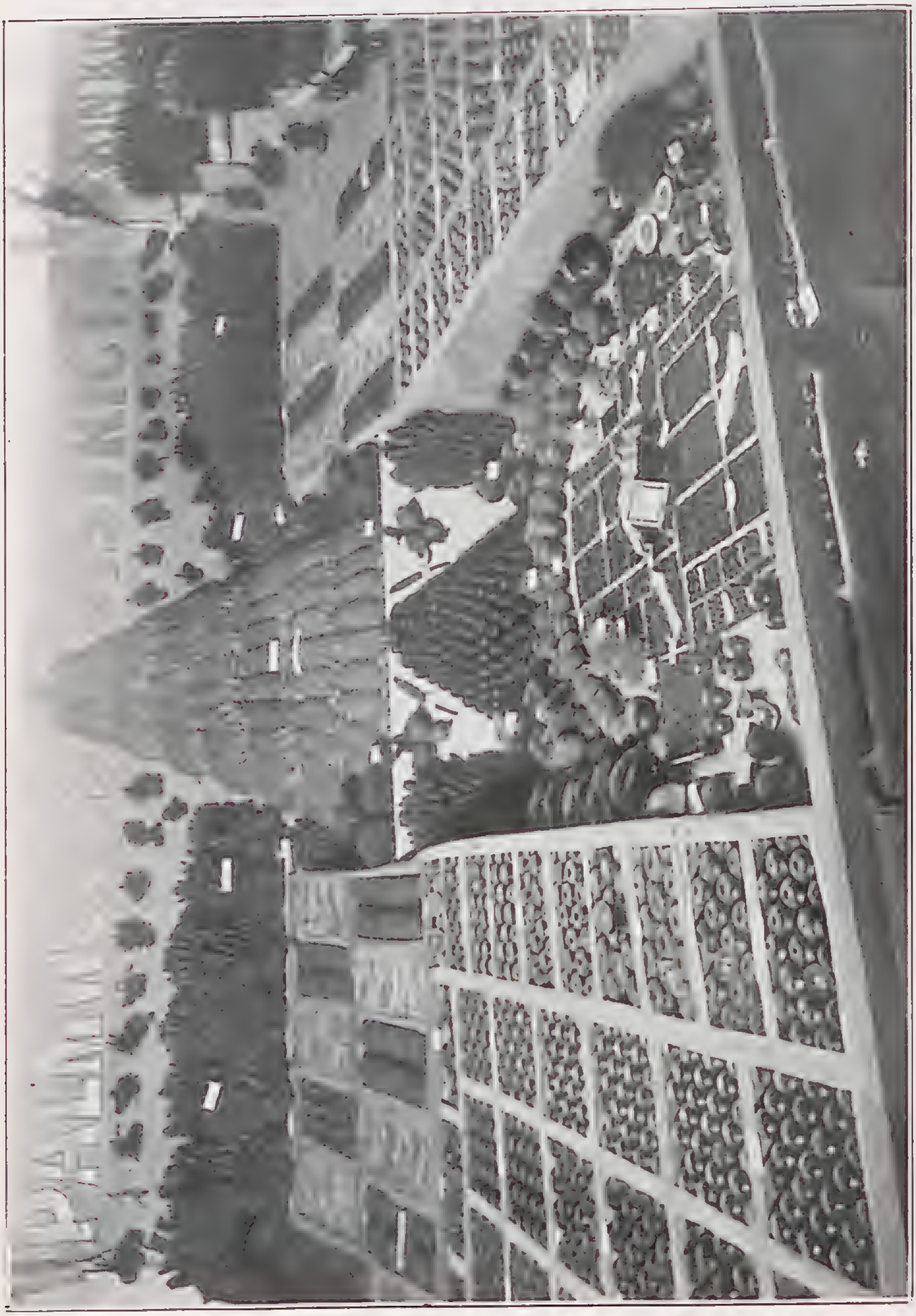


PLATE 83.—FRUIT EXHIBIT FROM PALMWOODS.

Awarded First Prize at the 1931 Brisbane Show.

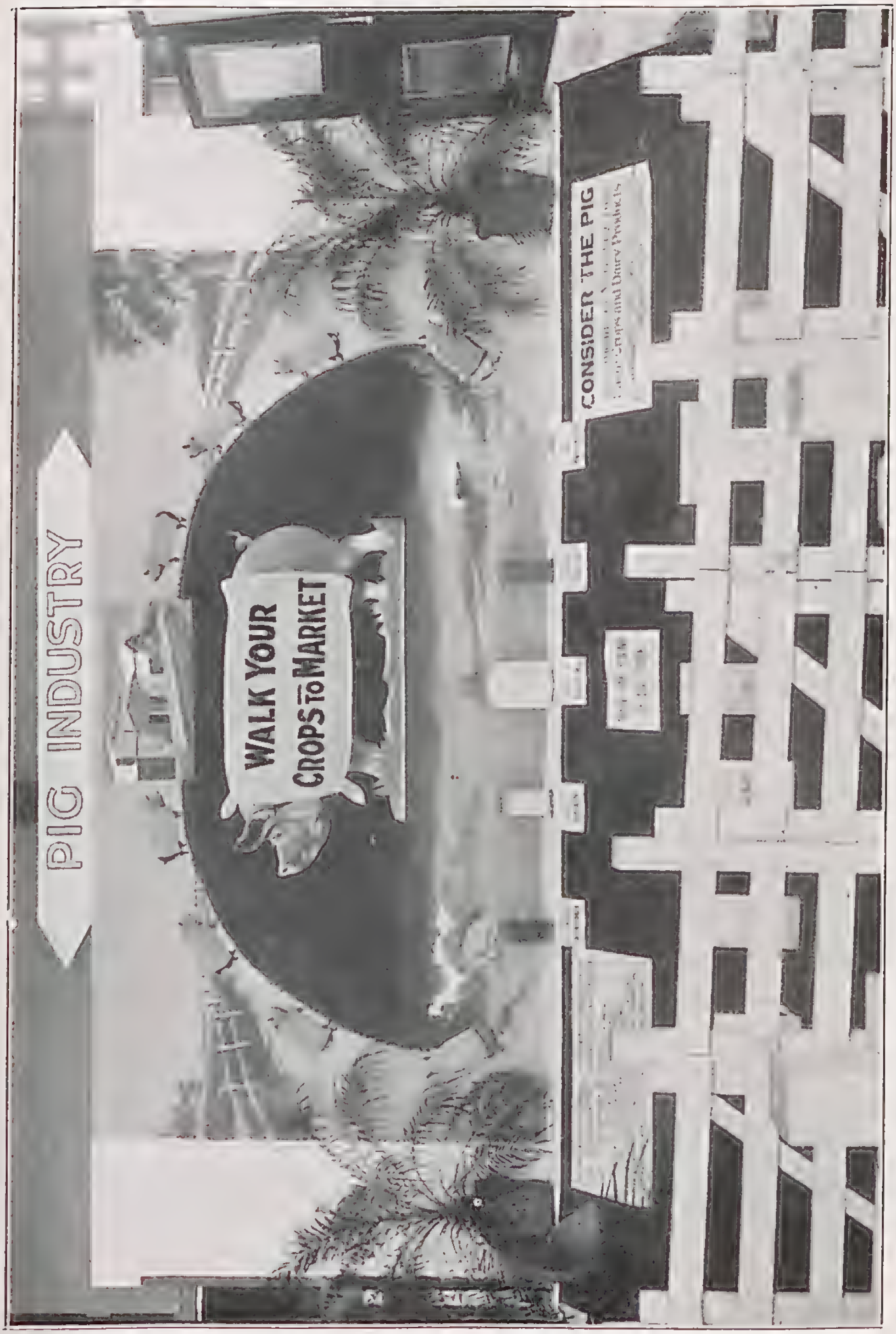


Plate 84.

This striking Diorama was a feature of the fine display of the Department of Agriculture and Stock in the Pig section of the Brisbane Show.

PLATE 85.

Panel of the Sugar Exhibit arranged by the Bureau of Sugar Experiment Stations in the Court of the Department of Agriculture and Stock at the Royal Brisbane Show, illustrating the genealogical "tree" of P.O.J. 2878, the "Java Wonder" Cane.

Plate 86.

Sugar technology was illustrated interestingly in the Court of the Department of Agriculture and Stock.

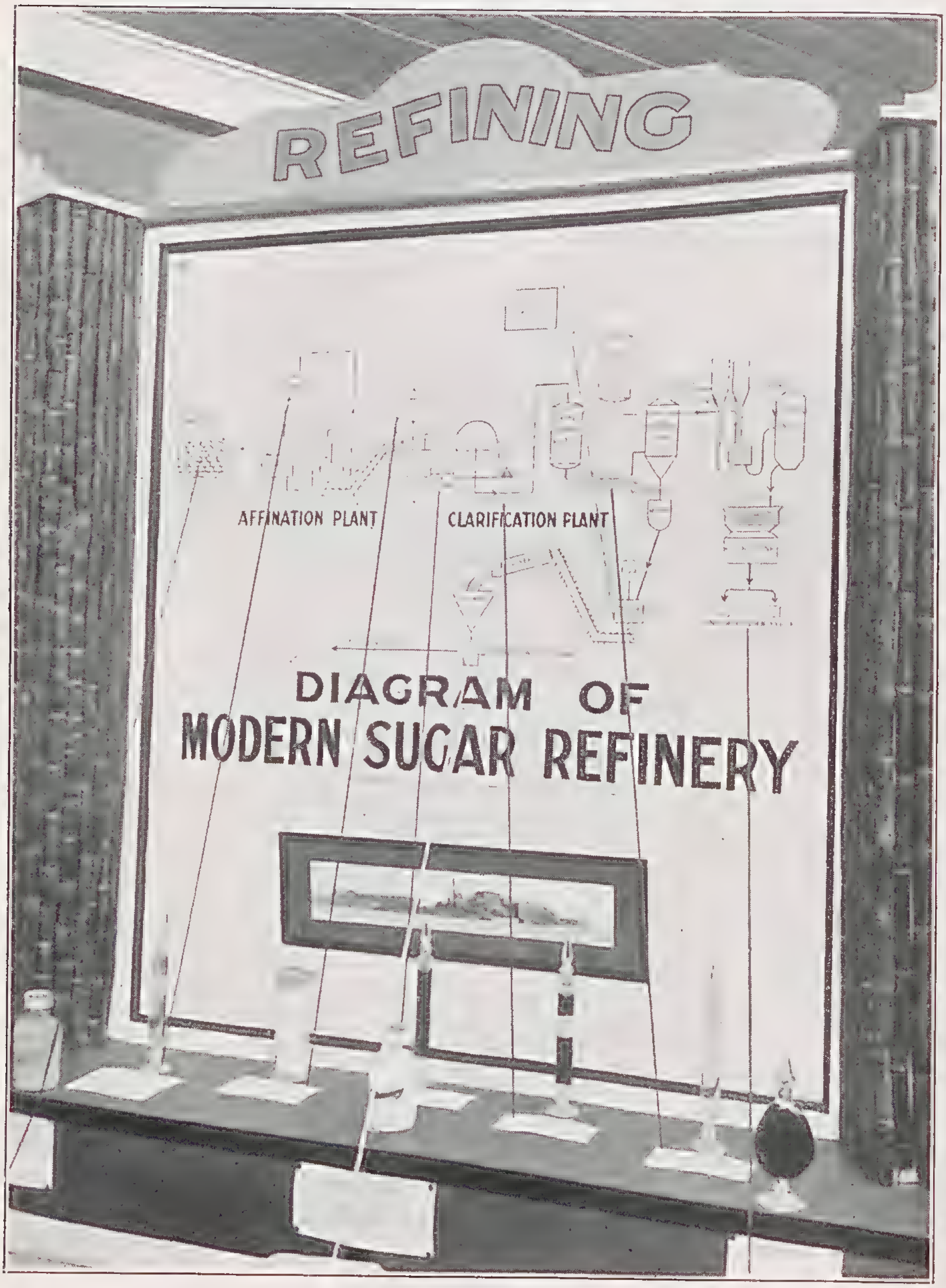


PLATE 87.

The manufacturing side of the sugar industry was represented graphically in the display by the Bureau of Sugar Experiment Stations in the Departmental Court at the Brisbane Show.

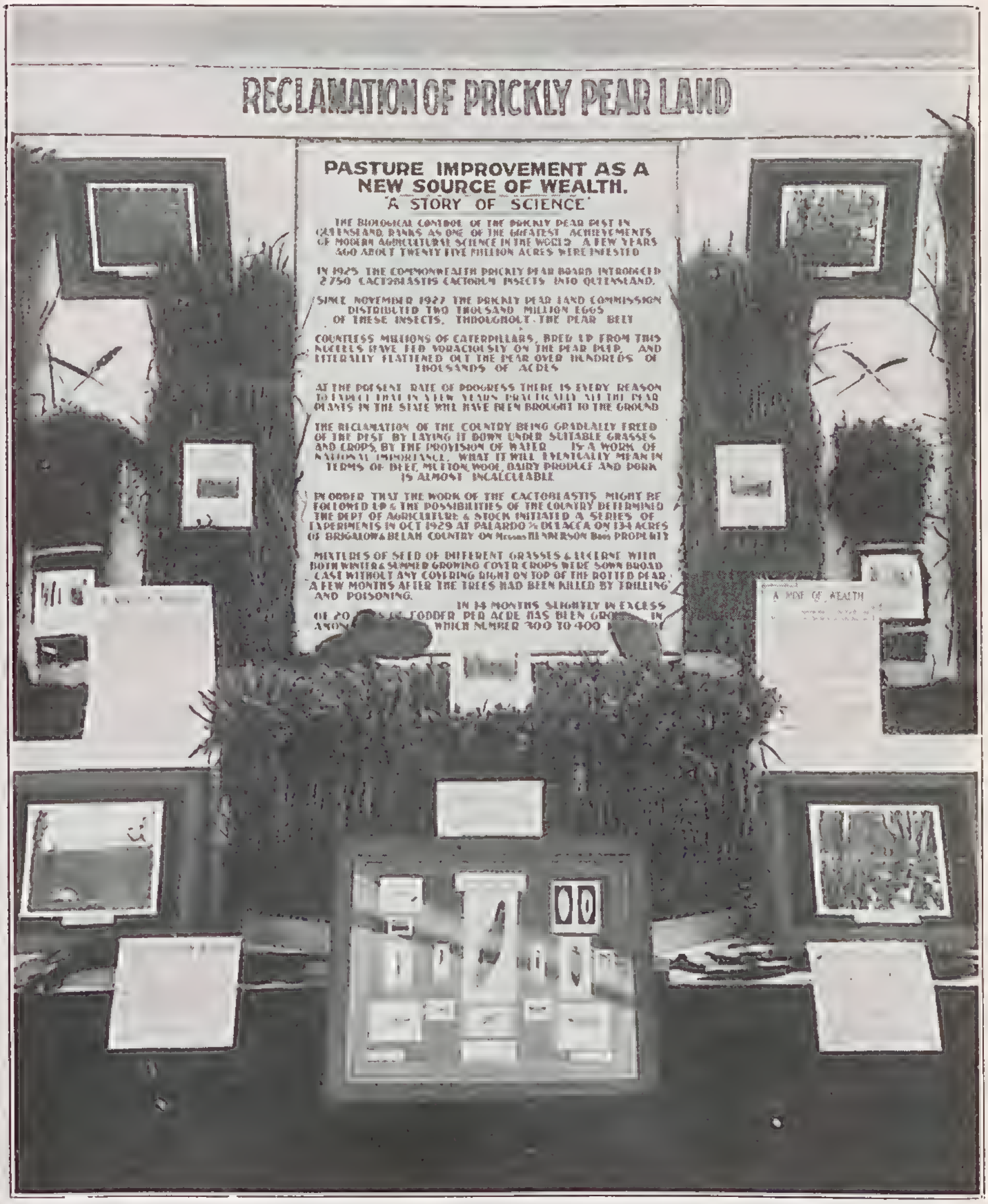


Plate 88.—An Impressive Panel in the Court of the Department of Agriculture and Stock at the Brisbane Show.

The success of biological control of the prickly-pear pest was well illustrated in this exhibit, as well as the subsequent reclamation of infested land.

The samples of produce displayed represent a heavy harvest of grass and fodder crops grown on land freed from the pear pest through the agency of an insect enemy, the *Cactoblastis Cactorum*.

In fourteen months slightly in excess of 20 tons of fodder per acre have been grown on what was formerly heavily infested soil, and among brigalow and belah trees, numbering from 300 to 400 to the acre, which had been killed previously by "frill" ring-barking and poisoning. The reclamation of this class of country, comprising many millions of acres in Queensland, must increase its stock carrying capacity enormously, and is therefore regarded as a work of great national importance.

PLATE 89.—THE "Q.A.J." AT THE EXHIBITION.

The Journal Alcove in the Court of the Department of Agriculture and Stock, 1931 Brisbane Show. Mr. W. E. Hagger in charge.

Plate 90.—Economy, no longer the Dismal Science.

This Corner of the Court of the Department of Agriculture and Stock at the Brisbane Show, arranged by the Bureau of Economics, attracted a multitude of seekers after information on the rural economy of Queensland.

PLATE 91.—CEREAL AND FLAX DISPLAY IN THE COURT OF THE DEPARTMENT OF AGRICULTURE AND STOCK, BRISBANE SHOW.

This exhibit attracted much attention and illustrated the great progress Queensland has made as a grain-growing State, in respect of broad acreage, high yield, and excellent quality.

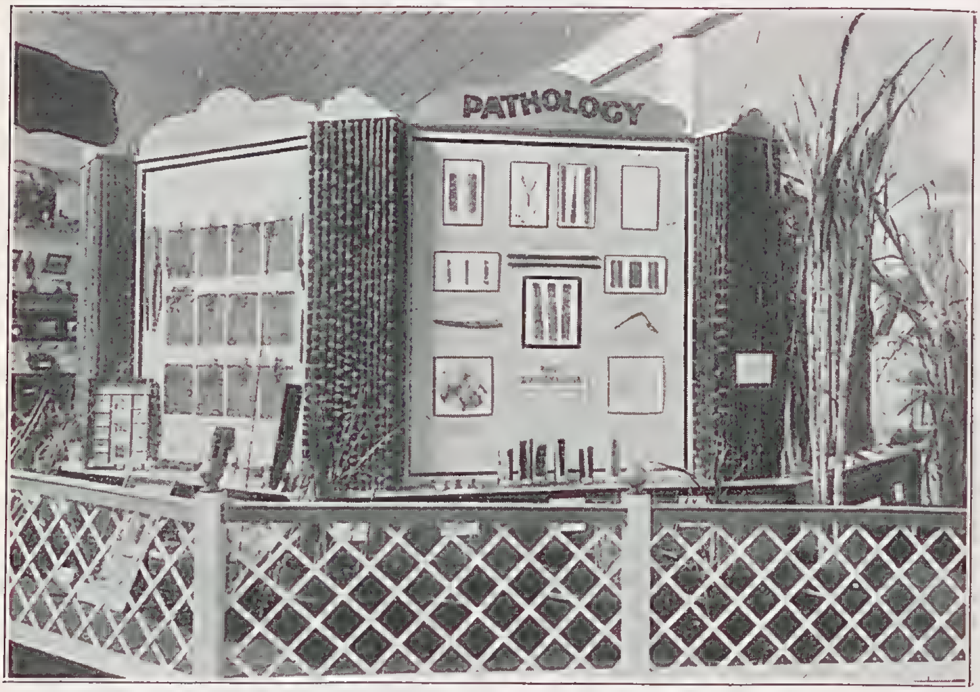


PLATE 92.

The Queensland Sugar Industry in all its branches was illustrated impressively by the exhibit arranged by the Bureau of Sugar Experiment Stations in the Court of the Department of Agriculture and Stock.

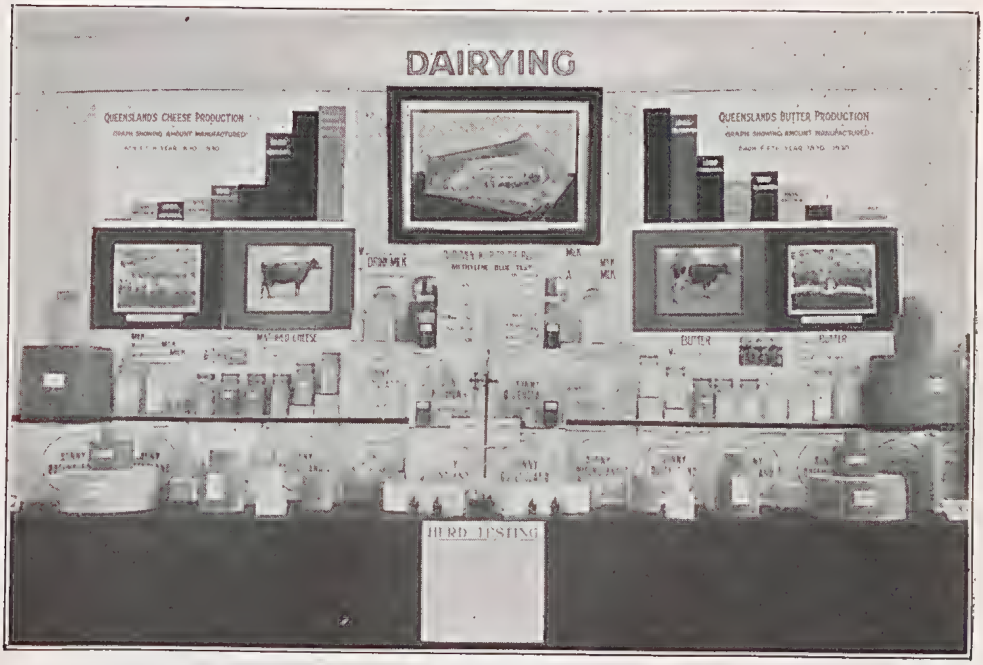


Plate 93.—The Dairying Industry was represented effectively by this Display in the Court of the Department of Agriculture and Stock.

Dairying is expanding remarkably in Queensland, where conditions are ideal for its development. Its annual value to the State is now about £8,000,000. The high reputation of Queensland butter and cheese is already well established on home and oversea markets.

Plate 94.—Fruit Packing Exhibit by the Children of the Montville State School.

Awarded First Prize and the John MacDonald Shield at the 1931 Brisbane Show.

PLATE 95.

Tobacco Alcove in the Departmental Court, showing excellent samples of bright leaf grown at Mareeba, Townsville, Bowen, Sarina, Rockhampton, Miriam Vale, Brisbane, Ballandean, and Texas.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

[*Continued from the June issue.*]

PART VI.

This is the sixth article of a series planned for the purpose of supplying information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep raising in Queensland on comparative small holdings.

THE sheep and wool section of the Department of Agriculture and Stock, being interested in the welfare of the industry in Queensland is ever ready to do anything in its power to assist sheep farmers in any difficulty pertaining to their business. The sheep men are scattered practically all over the State, and unless they place themselves in communication with the Department in connection with any difficulty which they may encounter it is obviously impossible to give the service required.

POINTS IN SHEEP FARMING PRACTICE.

Merino Breeding for Wool and Mutton.

For this method of sheep farming suitable conditions and pastures are necessary. Where the annual rainfall is in the vicinity of 20 inches, with a supply of good water well distributed, an inter-mixture of grass, herbage, saltbush, and other edible shrubs, and well but not over shaded paddocks which can be conveniently worked, success is fairly well assured. A thorough knowledge of the business is also necessary, with an inclination to improve the flock by culling and selection.

Young Wethers for Wool Production.

Buying wethers when young and retaining them for wool production is a very safe undertaking and can be practised by those more or less inexperienced in sheep farming, but it is not so profitable as when breeding is carried on successfully. The country need not be so good. Where breeding may be a failure, wool growing can be carried on successfully. There are several influences that usually lead to the adoption of this system, such as want of shade on the exposed Western plains, distance from water, green timbered country, climatic conditions, and parasitic infestation.

Store Stock.

Buying store sheep to fatten and sell as soon as opportunity offers is usually practised where crops can be raised, and this enterprise is more suitable to plateau and coastal conditions.

Crossbreeding for Wool and Mutton.

This system is usually adopted in districts of heavier rainfall. In areas where the annual rainfall is over 25 inches, many crops suitable for running sheep on can be produced, and also for fodder conservation. In such localities the merino ewe, having grown to maturity in the West, may be mated with a suitable long-wool ram, the progeny of which make good growth. After the second shearing they may be fattened, when they make first-class mutton sheep.

Fat Lamb Raising.

This is an enterprise that must be confined to areas with a fairly good rainfall and suitable for the production of winter fodder crops or lucerne, and should be run on purely mixed farming lines.

Whatever method of breeding is adopted, purebred rams should be used, for blood tells in sheep raising, as in every other branch of animal husbandry.

Lamb Marking.

The method of yarding and working the ewes and lambs in preparation for marking operations vary according to the size of the flock, but the precaution of cleanliness in every respect is of first importance in all cases.

A good practice is to have a yard erected in the paddock where the ewes and lambs are running. This may consist of a large receiving yard (which may be of wire netting), and a small yard into which the lambs can be drafted for treatment.

Knives or instruments used in lamb marking should be sterilised first in boiling water, and then in an antiseptic solution. A quantity of this solution should be kept in a handy place for putting the marking instruments into at intervals. If small numbers are to be marked, all arrangements are made accordingly, and the one operator does the ear marking, castration, and tail docking, but where large numbers are to be treated there should be catchers, who first present the lamb to the ear markers, one marker to apply the registered mark and the other the age mark. All ram lambs should be placed on the marking rail with the two left legs held firmly in the holder's left hand and the two right legs in similar position on the right side. There are three distinct methods in use:—(1) Tipping: This is done by completely removing the tip of the purse, and is in more general use than any other method. (2) Slitting: This means that the purse is opened by splitting it down the centre. It is claimed by many who adopt this method that it heals quicker and gives more protection from flies. With either method the operator uses his teeth in drawing the testicles. When the wether is matured the result of the slitting shows to more

PLATE 96.—ON A QUEENSLAND SHEEP FARM—SAVING THE ORPHAN LAMBS.

advantage as the cod is better developed with a more regular and neater appearance. (3) The third method is that by which the purse is left intact. This operation is performed with the aid of powerful blunt-edged pincers which completely crush the cords without breaking the skin. The testicles are gradually absorbed in the system, leaving the cod large, which is an advantage in selling wethers as fats. After castration the lamb's tail is docked. This is done at the second or third joint. The skin should be pressed firmly to the tail, then held tightly and severed in one back-hand slash. The purse and tail wounds are then dressed. The dressing should consist of a healer as well as an antiseptic, such as a special patent proprietary solution, many of which are on the market, or 8 pints of standard liquid sheep dip to 100 gallons of water, to which may be added a little iodoform. A home-made dressing may consist of equal parts of Stockholm tar and fat, with the addition of one part kerosene or liquid dip to twenty-five parts of the mixture. A powder dressing may also be used, consisting of one part iodoform to ten parts boracic acid and sprinkled lightly over the wounds. After the wounds are dressed the lamb should be placed on his feet, preferably in the paddock with the ewes where, after mothering, they usually remain until weaned.

RETIREMENT OF MR. J. C. BRÜNNICH.

THE retirement this month of Mr. J. C. Brünnich from the office of Agricultural Chemist in the Department of Agriculture and Stock, under the age limit regulations, will mean the severance from official life of one of the most capable men in the service of the State.

His pending retirement has already been marked by many fine and fitting tributes to his worth and work in the metropolitan and country press.

A NOTABLE CAREER.

Mr. Brünnich was born at Gorizia, Austria, where his father was stationed as a minister of the Lutheran Church. In early youth he went with his parents to Switzerland where he received his primary education. He afterwards attended the Federal Polytechnic School at Zurich, where he studied chemistry under Professors Dr. Victor Meyer and George Lunge. Specialising in sugar chemistry he gained practical experience in beet sugar factories in Bohemia and Russia. Returning again to Switzerland to fulfil his military obligations, he became an officer of artillery in the Swiss service. There he made the acquaintance of the family of Dr. Muller who practised medicine for many years in the Gayndah district of Queensland, and on his glowing accounts of this State, Mr. Brünnich decided to come out here. He arrived in 1885, and secured the management of a small sugar refinery at Bulimba, and later became manager of a sugar mill at Darwin, North Australia. He joined the scientific staff of the Colonial Sugar Refining Company, with whom he remained for ten years. In the course of that time, he was mill manager and chemist at Homebush, North Queensland, where, under his direction, much experimental work was carried out, particularly in relation to cultivation and fertilising, including green manuring. He also conducted the first experiments there with the injection of carbon bisulphide for the destruction of cane grubs. In 1897 he was offered and accepted the position of Agricultural Chemist to the Queensland Government. Among other duties he held a lectureship in chemistry at the Gatton Agricultural College, his headquarters for some years. He then came to Brisbane and, in the early days of the Bureau of Sugar Experiment Stations, he was associated directly with that branch of the Department of Agriculture and Stock in the capacity of Supervising Chemist. He afterwards organised the Departmental laboratory, which is considered to be one of the most efficiently staffed and most completely equipped in the Commonwealth.

For the last twenty-five years Mr. Brünnich has been in full control of the agricultural chemistry activities of the Department, and has earned a reputation for his investigational work which is not confined to Australia. Men who have spoken in the highest terms of Mr. Brünnich's contributions to science are the late Sir William Macgregor, Sir Arnold Theiler, of South Africa, Sir John Russell, of Rothamstead, England, and Dr. Orr of the Rowett Institute, Scotland.

Mr. Brünnich's experience and knowledge were largely drawn upon, from time to time, in the preparation of legislation, for which no precedent existed. Such laws included the Fertilisers Act, Stock Foods Act, Margarine Act, and Pure Seeds Act.

While supervising a large and important branch of a Department, Mr. Brünnich managed to find time to carry out a large number of research and experimental investigations, among which may be mentioned:—

Fertilizer experiments at Buderim Mountain to demonstrate the possibilities, by means of the correct application of fertilizers, of bringing exhausted soil back to the economic bearing of banana crops.

Bringing before the notice of pastoralists the deficiency of both proteid matter and phosphoric acid contents of their pastures, and introducing the use of a sheep phosphoric lick by means of Nauru phosphate.

The advocacy of Paradichlorobenzene as a pest control.

An investigation into the pollution of rivers and streams by the discharges from sugar mills, and the giving of advice for the prevention of same.

Exhaustive analyses of soils from different parts of the State, and of fodders, grasses, plants poisonous to stock, gums, resins, essential oils, and tanning materials.

Experimental work with prickly-pear spray solutions.

Experiments with inks for branding meats.

The institution of the most effective and at the same time, most economical formula for a cattle dipping fluid.

PLATE 97.—MR. J. C. BRÜNNICH, F.I.C., F.C.S., F.A.C.I.

Mr. Brünnich's contributions to scientific and popular literature are too numerous to list completely, but the more notable, in chronological order, are:—

1898—The World's Cane Sugar Industry.
Compositon of Foods.
Starch Contents of Potatoes.
Denitification.

1899—Boric Acid in Butter.

1900—Some Queensland Soils (Experiment Stations).
"What Kind of Manure should I Use?"
Analysis of Seeds of the Moreton Bay Chestnut.

1901—Full Analyses of Cheese and Butter at the Queensland Agricultural College.

1902—Hydrocyanic Acid in Fodder Plants.

1903—Analyses of Pineapple Plants, Fruits, and Soils.
Analyses of Seed Wheats and Maize.

1905—Green Manuring.
Poisonous Glucosides in Sweet Potato Vines.

1907—Fodder Analyses.

1908—Plants Poisonous to Stock.

1909—Formaldehyde Tests.
Farm Crops as Food for Stock.
The Land We Live On (Presidential Address, Royal Society).

1910—Analyses of Queensland Cheeses.
Destruction of Prickly-pear by Arsenical Sprays.
Wheat Culture in Queensland.
Insecticides and Fungicides.
Dairy Salts.

1911—Soils of the Upper Burnett (in collaboration with G. R. Patten).
Analysis of Fertilizers.
Wheat Culture in Queensland.
Plants Poisonous to Stock (Native Fuchsia).
Growth and Cultivation of Sugar-cane.
Banana Manuring Experiments.
Testing of Farm Seeds (in collaboration with G. H. Gurney).

1912—Some Queensland Mangrove Barks and Other Tanning Material.
Determination of Moisture in Butter (in collaboration with Frank Smith).
Notes on Dipping Fluids.

1913—Complete Fertilizers for Farm and Orchard.
Balanced Rations—Feeding on a Scientific Basis.
Soils of the Stanthorpe District (in collaboration with G. R. Patten).
Cultivation and Manuring of Orchards.
Stock Foods.
Prickly-pear—Analysis of Varieties.
Testing of Farm Seeds.

1914—Agricultural Lime and Limestone in Queensland.
Manuring of Bananas.
Dipping Fluids—Determination and Efficacy.

1915—Poisonous Plants (Dysphania).
Grass Dangerous to Stock (*Eleusina indica*).
A New Dipping Fluid (in collaboration with Frank Smith).

1916—Tannin Contents of Queensland Barks (in collaboration with A. T. Jefferis).
Laws relating to Fertilizers.

1917—C.c.s. in Cane.

1919—Lime and Magnesia in Queensland Soils.

1921—Digestibility of Fodders.
Cotton Seed as a Stock Food.
Mixing of Fertilizers.

1923—Elementary Lessons on the Chemistry of Farm, Dairy, and Household (Second Edition).

1924—Complete Fertilizers for Farm and Orchard.

1925—Fertilizer Don'ts.

1926—Mineral Deficiencies in Pastures.
Influence of Composition of Foods on the Health of Stock.

1927—Water for Irrigation and Stock.

1928—Stock Foods (Second Edition).
1929—Malnutrition.
1931—Stock Foods (Third Edition).
Nutrition in Sheep (in collaboration with W. R. Winks).

For many years Mr. Brünnich has been a member of the Royal Society (Queensland), of which he is a past president. In 1905 he was elected a Fellow of the Institute of Chemistry of Great Britain and Ireland, and is a foundation member and Fellow of the Australian Chemical Institute.

In his younger days, Mr. Brünnich was an enthusiastic volunteer and commanded a squadron of Light Horse with the rank of Captain. His former C.O., Major-General Spencer Browne, C.B., regarded him as a very useful member of a staff of outstanding merit to whom the efficiency of the Queensland Mounted Infantry and the Queensland units of the Australian Light Horse, which has become traditional, was largely due.

AN APPRECIATION.

A member of the Agricultural Chemistry Branch of the Department of Agriculture and Stock has contributed the following appreciation of his old Chief:—

As one associated with the Agricultural Laboratory for a lengthy period of years, I feel it a duty, as a tribute from the present staff, and officers who have passed through his hands, to pen a résumé of the long, faithful, and meritorious record of our Chief, Mr. J. C. Brünnich, after a strenuous thirty-four years of public service.

Formerly connected with the Colonial Sugar Refining Company at Homebush, Mackay, as chemist, he was appointed in 1897 as the first Chemist to the Department of Agriculture at Gatton College, combining also the duties of Science Master. He early made an investigation into the pollution of rivers and streams by effluents from several sugar mills, and advised on its prevention.

The successful settlement of the Lockyer district may be attributed in some measure to his work on the soils of the Gatton College Farm. His foresight was exceptional, for as far back as 1899 he recommended a thorough and exhaustive analysis of the soils from different parts of the State, and a year later stressed the need for extensive work on fodders, grasses, plants poisonous to stock, exudations of trees—e.g., gums and resins, essential oils, tanning materials, and prospective natural deposits of manurial value.

Experimental work with prickly-pear spray solutions and inks for meat branding was carried out, and a survey made of the natural grasses of the State under varying conditions. In this year he attended an agricultural conference at Bundaberg with regard to the testing of Queensland wheats, and about this time instituted a formula for a cattle dipping fluid, which forms the basis of many now being used with good results.

Grazing and agricultural interests were well served by him, and the pastoral possibilities of Queensland were demonstrated by his chemical work.

That Queensland maizes were richer in protein compared with imported grain was shown by him in 1904, a matter of importance with the advent of scientific stock feeding, which has so much progressed in recent years. Of particular interest also is his analysis of *Rhizopora mucronata* and *Cenops condolleana*—Queensland species of barks containing 48 per cent. and 42 per cent., respectively, of tannin—and his suggestion that our mangrove barks might be used for the manufacture of "Cutch."

In 1905, in addition to his other work he was appointed Supervising Chemist to the Bureau of Central Sugar Mills, thus performing useful services to the sugar industry. His work on wheats, including the lipoid phosphorous content of grain, was performed in this year.

In the following year the laboratory was transferred at his suggestion to Brisbane, near the present Public Library, and besides increased routine work he made the important recommendation as to feeding molasses with sorghum, sweet potato vines, and such other foods as are liable to contain cyanogenetic glucosides as a possible antidote for the latter. This came about through his extensive reading, being in the first instance proclaimed through the Nebraska Experiment Station.

Appearing first in the "Queensland Agricultural Journal" as a series of articles, his book, "Elementary Lessons in the Chemistry of the Farm, Dairy, and Household," is now recognised as a standard work.

Mr. Brünnich was ever anxious to increase the commercial value of the laboratory, and in 1908 hops, malts, and barley from Queensland maltsters claimed his attention with this end in view.

About this period, too, his outlook envisaged the deep thought and work of the latter-day soil research chemists, for in 1910 he recommended that a soil survey, even on a small scale, be carried out, and a few years later advised that " . . . . the

most important work is undoubtedly the extension of knowledge of the soil types of new districts . . . the gradual soil survey of the settled districts and the study of the changes taking place in our soils after years of cultivation and cropping.''

Important banana manuring experiments, analysis of the soils of the Upper Burnett district and Wallum soils were initiated twenty years ago, and later soil effects in connection with disease in pineapples gone into. The year 1913 saw him responsible for trials with wheat as regards their manuring and milling, also the baking qualities of flour produced therefrom, and he showed that Queensland soils contained sufficient sulphur for all requirements, whilst chemical advice was given to such industries as brewing, canning, cordial, vinegar, and tanning.

For the last ten years, soil acidity and base exchange determinations have been made for future reference, and interesting work done on the Atherton-Tolga Tableland soils, regarding depletion of mineral plant foods and their deficiency in potash reserve. Besides, valuable and valued help has been given the cotton industry and Forestry Department.

At the Conference for the Advancement of Science in Melbourne in 1921, Mr. Brünnich delivered a paper on ''Digestibility of Fodders,'' the outcome of experimental work under his guidance, creating considerable interest thereby.

In 1922 he pointed out that the soils of the Dawson River Irrigation Scheme compared very favourably, from a chemical and physical viewpoint, with those of the older established Yanco and Murray River settlements; while his analyses of samples from the Coominya Soldier Settlement emphasises forcibly the need for chemical investigation at least before settlement. For some years he has been a member of the Cattle Tick Dip Committee, which is responsible for experiments on the tick pest, under the aegis of the Commonwealth Council for Scientific and Industrial Research. His work in conjunction with factories resulted in an improved pineapple pack in 1922.

Conferences of Agricultural Chemists—Melbourne, 1921, and Sydney, 1924—were attended by him, resulting in uniform Bills relating to stock foods, fertilizers, insecticides, and pest destroyers being formulated. He was the first to suggest the use of dichlorobenzene, which now finds successful application, for the destruction of the cane grub.

In 1924 the laboratory was further transferred to the Departmental Buildings, and is laid out on most modern lines, being a credit to Mr. Brünnich and the Department. Experiments regarding pasture improvement were begun in 1926, and are still progressing, and work for the Council for Scientific and Industrial Research in the matter of grasses and edible shrubs was carried out, since when Mr. Brünnich put forth the suggestion for the use of Nauru phosphate as a lick or incorporated in such as an adjunct in nutritional problems in so far as the phosphoric acid deficiency of the State's grasses, as proved by repeated analyses, are concerned. In this matter he was ably supported by the late Professor T. Brailsford Robertson.

Latterly he has been engaged upon experiments on the feeding of dairy cows. Consequently there does not seem a phase of agricultural, pastoral, or dairy work that he has not touched upon in its chemical aspects. His analyses are quoted in many scientific journals, particularly by Dr. E. J. Russell, of the famous Rothamstead Experiment Farm. Again, on the occasion of the visit of Sir Arnold Theiler a few years ago, that eminent scientist expressed agreeable surprise and made appreciative reference to the amount of valuable data obtained by Mr. Brünnich in the course of his work.

He has at times conducted lecture tours throughout Queensland, is a Fellow of the Institute of Chemistry of Great Britain and Ireland, Fellow of the Chemical Society, a foundation member and Fellow of the Australian Chemical Institute, a past president of the Royal Society of Queensland, an examiner in conjunction in Sugar Chemistry for Technical Colleges, besides being a member of various State and Commonwealth Technical Committees for scientific and economic advancement.

His pen has been used prolifically in preparing pamphlets and articles, mainly through the ''Queensland Agricultural Journal,'' for the dissemination of chemical knowledge. Mr. Brünnich's ''knowledge complex'' must be very involved, and at the same time capable of high dissociation, owing to the extraordinarily wide range of advice which he has been called upon to give in answer to the many and varied questions of a chemical nature with which he has been beset.

He is tenacious of and emphatic in his opinions, withal modest and retiring. Although no elaborate experiments have been carried out recently owing to a circumscribed scope due mainly to lack of finance, still the work he has been instrumental in performing will prove, and is even now proving, very valuable to the younger chemists working in the interests of Queensland and Australia through the Departments of Agriculture, and well might the foundation stone of the chemical progress of the Agricultural Department be deeply inscribed ''This stone was laid in 1897 by Mr. J. C. Brünnich, F.I.C., F.A.C.I., Agricultural Chemist.''

STOCK FOODS.

By J. C. BRÜNNICH, F.I.C., F.C.S., F.A.C.I., Agricultural Chemist.

PART II.

The wealth of our State is based to a very large extent on the number of our live stock, and the welfare of the stock again depends entirely on the feeding; therefore the question how, when, and what to feed is of greatest importance to farmer and grazier.

All our wool, meat, hides, dairy produce, eggs, and the labour performed by horses and cattle are the result of feeding. All our live stock can be regarded as living factories producing from the food consumed products useful to man.

As a large proportion of our stock in Queensland is pasturing on natural herbage, the feeding under normal conditions is therefore more or less outside the province of agricultural science; but in times of scarcity, which periodically occur, hand feeding must be resorted to, and at such times it is of the utmost importance to have some knowledge of the composition of various stock foods, which have to be used in connection with poorer roughage to keep stock in good condition.

In this paper Mr. Brünnich discusses stock foods and their values, and his notes will be accepted by readers as a valuable contribution to our information on important points in animal husbandry.—ED.

Comments on Various Stock Foods.

Grass.—Natural grasses are without doubt the cheapest of stock foods, but, as we can see from the analyses, ordinary pasture is of very varying composition, and therefore stock which depend on natural pasture alone are only for short periods of the year "on clover."

I cannot refrain from quoting here an extract from a lecture on stock foods, delivered at the Beenleigh and Rockhampton agricultural conferences by the late Professor E. M. Shelton. The remarks made over thirty years ago by this keen observer of wide practical experience apply equally to the present day, and put the position of dairying and grazing on natural pasture in a nutshell:—

"Our Great Reliance on Grass.

"The natural grass in Queensland is so abundant and unfailing, and, as compared with artificial forage, so easily got that stockowners outside the towns complacently regard it as sufficient food for all classes of stock at all times and seasons. It is only when protracted drought becomes calamitous that stockowners begin to realise the dangers of complete reliance upon natural supplies of stock food. Even during favourable seasons the annual loss, from the poverty of wild grasses during the winter months, must in the aggregate be enormous. During much of every winter our herds are losing the flesh accumulated during favourable summer months, thus literally converting flesh into nearly worthless manure, a process that can hardly prove profitable to the stockraiser. Let this be understood: good grass is the cheapest and best single stock food. No form of artificial food, whether grain, roots, or residual products, can compete in cheapness with natural herbage as a source of beef, mutton, and the other products of feeding; but to rely wholly and entirely upon

the spontaneous herbage is to fail in obtaining the principal advantages derivable from such natural pastures. By piecing out the failing grass with hay, silage, or green fodders, we keep our animals in the highest working condition with that **small amount** of feed that every stockman knows is required to maintain vigorous, thick-fleshed animals up to their greatest efficiency. After the animal once becomes reduced in flesh, let the owner attempt to bring it up again to its condition of greatest usefulness as a milker or meat-making machine, and he will have it brought home to him, in a thoroughly practical way, how great his loss has been through sparing the feed. **Other things being equal, the animal that consumes the most feed gives the largest profitable return for feeding.** A hint of why the full-fed animal returns the largest available profit is furnished by our knowledge of the ultimate use to which food is put. It is plain that food is applied to two purposes: it goes to make up the loss of the animal machine itself through constant wear; and it is applied towards the production of the object of feeding—milk, beef, wool, &c. It is clear also that if the animal gets of food only sufficient to supply the constant wear and tear incident to existence, the feeder gets nothing in return for his feeding. But if he gives in quantity beyond the vital demands of the animal, that surplus will, more or less, go to the production of the valuable article which is the principal object of his feeding. Profit always comes out of the excess feed, and not from the small amount that is really required to maintain existence."

Quite excellent hay can be made from our natural pasture grasses, and an analysis of "bush hay" over fifteen years old showed it to possess a fairly high feeding value.

Unfortunately in good seasons enormous amounts of grass go to waste, as all the grasses, after being dried up, exposed to dews and scorching sun, rapidly deteroriate, losing colour, flavour, and quality, and have but little feeding value, so that they are only fit to be burnt off.

There is but little difference between the food values of the various most popular cultivated grasses—Paspalum, Canary grass, Rhodes grass, Sudan grass, and others—yet the variation in the composition of the sample, according to season, locality, and age of crop in each species, is very much greater than the variation in composition from one species to another. It is quite obvious that it is impossible to judge the value of any grass by a few isolated analyses.

There are a few grasses like Couch grass (*Cynodon dactylon*) and Prairie grass (*Bromus unioloides*) which stand out on their own on account of high food value.

The great nutritive value of young grass in its earliest stages of growth, and only a few inches high, has become recognised in England and elsewhere recently, and caused the introduction of a new system of depasturing grass lands.

In my Annual Report of 1914, where I gave the analyses of a large number of grasses from various pastures, I showed the higher food value of the young growth, and remarked on the loss of nutritious value when grasses are allowed to seed. As a matter of fact, the young shoots of grasses, about 4 to 6 in. high, are equal to many valued concentrates with regard to the protein content, and this accounts for the rapid recovery of cattle and sheep grazing on pasture, after getting a few showers of rain, following spells of dry weather.

The **new system of grass land management,** now being most successfully practised in England and many other places, is based on a combination of the following factors:—

(1) Liberal use of intensive and balanced fertilizers, followed by successive top dressings with nitrogenous fertilizers.

(2) Close rational rotational grazing off by stock under a carefully planned system.

(3) Systematic thorough cultural treatment.

Grass and herbage kept short contains a much higher amount of digestible protein than grass grown under the old methods of grazing. Young shoots of grass, from 4 to 6 inches long, contain as much and frequently more protein than valuable concentrates, grains, and legumes.

Such young, rich grass can only be secured by this system of **rotational grazing.** As soon as the grass reaches this height of 4 or 5 inches, sufficient stock must be put into the paddock to ensure complete grazing off in a few days, which requires at least twelve cows per acre. Pastures should get similar treatment as other fodder crops, cultivation and application of complete fertilizers supplying nitrogen, phosphoric acid, and potash.

To ensure good, uniform growth of grass, the land after grazing off must be harrowed to break up and spread the droppings, to remove any dead growth, break up any mat of dead herbage, aerate the soil, &c., and only after the pasture has been cleaned up the necessary fertilizers are applied.

If at any time the growth gets out of hand a mowing machine must be used to keep the grass short. How far such a system could be applied extensively in Queensland is, of course, problematic. There should be no difficulty in good dairying districts; a great increase of clovers in the pasture will be the immediate result, and should give a much increased yield of milk. Even in pastoral holdings the cutting up of areas into smaller paddocks, giving each periods of rest between grazing off, should be found advantageous.

Roots and Other Succulent Stock Foods.

In Europe, Canada, and also in New Zealand, for the feeding of dairy stock, in addition to a rich pasture containing clovers, root crops play an important part. In our State we can supplement our natural pasture with the more valuable crops of lucerne and maize, and to some extent with pumpkins.

Mangels are the most watery of stock foods. Many of the Queensland-grown samples have a very low feeding value, much lower than the value obtained in root-crop-growing countries where the quality with regard to protein contents has been steadily improved by careful selection of seed. However, a special variety or cross of mangels, the "sugar mangel," several samples of which were analysed from the crop grown on our State farms, from seeds imported by Sir Matthew Nathan from the Cambridge School of Agriculture, gave as much as 1.7 per cent. of crude protein, making them a valuable food, as compared with our ordinary mangels containing only 0.6 per cent. of protein. Mangels and beets should not be fed to male sheep for long periods, as they are likely to cause urinary troubles.

Pumpkins are greatly relished by cattle, horses, and pigs, and are rather more nutritious than mangels. The seeds contain much protein and oil and should therefore not be wasted. Pumpkins are preferably fed raw to pigs. The seeds act as a slight vermifuge; fed in excess, however, the seeds may cause digestive troubles. Cases have been reported that pumpkin seeds caused trouble when fed to poultry.

Potatoes and sweet potatoes contain about twice as much dry matter as mangels. They have a good food value, but as a rule have too high a commercial value as human food to make them profitable for feeding of stock.

Sweet potato vines are a very nutritious, succulent food. They must be fed with caution to pigs, as in a few instances we found a hydrocyanic acid yielding glucoside in these vines. Any danger, however, is minimised by sprinkling a little molasses over the vines before being fed.

Silage.—One of the most economical means of preparing succulent foods for dry seasons and general use is by means of a silo. The most suitable crop for this purpose is maize. Crops of saccharine and non-saccharine sorghums may also be used; in fact, any succulent green crop may be utilised for the making of silage. Sunflowers, according to American and Japanese reports, make an excellent ensilage. A very fine sample of silage once submitted for analysis was made from wheat, thistles, and mustard. Another good sample was made with alternate layers of maize and prickly-pear. Leguminous crops, like lucerne, make a poor foul-smelling ensilage. The process of fermentation taking place in the silo has an influence on the nutrients in the food; some of the carbohydrates are lost, as well as small amounts of proteins are decomposed; again the digestibility of the remaining protein is somewhat lowered. These losses, however, are fully compensated by the succulence and palatability of the ensilage. No better ration for milking cows could be found than a mixture of lucerne hay and maize ensilage, with small amounts of bran and pollard or oil cakes.

Hay.—The simplest and best way to preserve green fodders, which has been practised from time immemorial, is to make them into hay by drying in the air in the sun. The moisture can be reduced to 8 per cent., and all further fermentation is arrested. If the hay is not properly dried, detrimental changes can take place during storage. The quality of the hay depends: (1) on the quality of the raw material, (2) on losses and changes during the drying, and (3) on changes which may take place during storage.

Lucerne hay is an almost ideal food for dairy stock. When cut very young, before flowering, the nitrogen ratio is a little too high, but the ratio is lowered when cut in full flower.

Straw.—When plants mature a large proportion of the organic compounds, both nitrogenous and non-nitrogenous nutrients, are transferred from the green portion of the plants to the seeds. At the same time all stems and stalks become harder as the cellulose of the fibre becomes more and more lignified, and but small amounts of proteins, fat, and nitrogen-free extracts remain in the straw or chaff when the ripening of the seeds is completed. In samples of oat straw, cut at various periods of maturity, the amount of crude protein fell steadily from 10.1 per cent. to 4.3 per cent., and at the same time the crude fibre was increased from 29 per cent. to 50 per cent. The lignification of the

cellulose or fibre in straw causes, when used as a feed, a great loss of energy for mastication, and consequently from 70 to 80 per cent. of the available digestible nutrients are used up to supply the energy required for mastication and digestion, and only from 20 to 30 per cent. of the nutrients are available for maintenance and production.

Cereal straws are very poor stock foods, and should only form a small portion of the ration. Ruminants can be given larger quantities than horses.

Leguminous straws are of considerably better food value, but not very palatable to stock—especially to horses.

Chaff.—Although the term **chaff** is elsewhere accepted as meaning the husks, or outer envelopes of cereal grain, with any light debris that may arise in threshing, in Queensland the term indicates hay or straw cut up into short lengths.

Unfortunately the chaffing of hay and straw tends to hide any foreign matter that such material may contain; further, the term **hay** should only be applied to any dried or cured cereal, grass or legume cut **before complete ripeness,** and in which the grain or seed has not been fully developed or removed. **Straw** implies any dried **ripe or mature** material from which the seed or grain has been removed by any process.

Chaff is liable to contain a good deal of rubbish such as sand, earth, dust, weed seeds, moulds, and spores of fungi, &c., which can cause serious troubles, and therefore if poor qualities of chaff have to be used, in case of necessity, such chaff should be scalded or steamed before being fed. A good many samples of chaff have come on the market lately which contain a large amount of stalks, leaves, and seeds of the thorn apple (*datura stramonium*), a highly poisonous weed. Such chaff is very dangerous to stock, and cannot be used as a feed, and the sale of any chaff or hay containing this weed is an offence under the Stock Food Act. Farmers should take particular care to prevent the spreading of this noxious weed.

Grains and Seeds.—The composition of the grains and seeds depends largely on the state of ripeness when harvested. Immature seeds contain more protein and mineral matter and less nitrogen-free extract than ripe ones. The quality of all grains is also influenced by soil conditions, manuring, and season.

Oats may be considered the most valuable of cereal grains, and have no equal for the feeding of horses. They are a very good milk-producing food, if they can be obtained cheaply enough. Ground or crushed oats are excellent for calf rearing, as a supplement to skim milk.

Barley is particularly useful for fattening all stock, and a standard food for pigs. An excellent ration for breeding pigs is made up from 30 per cent. barley meal, 30 per cent. maize meal, 35 per cent. pollard, and 5 per cent. meat meal or blood meal. The latter promotes growth and can be left out during fattening period, increasing at the same time the amount of barley and maize meal.

Barley grain containing too much protein for malting purposes is particularly useful as a stock food.

Wheat.—On account of its price, wheat is only rarely used for feeding of stock; low-grade and damaged wheat is a valuable food for poultry, and the shrivelled wheat generally contains more protein than first-grade plump wheat. Fresh wheat, whole grains, are dangerous to stock, and if used for fattening of cattle and pigs should be crushed

or ground. The by-products of milling wheat, **bran** and **pollard,** are of particular value. Bran, the outer coating of the wheat kernel, is rich in digestible protein, digestible carbohydrates, and fat, and contains comparatively high amounts of mineral matters, phosphoric acid, magnesia, and potash, but is poor in lime. Bran has a beneficial laxative effect, which is increased by giving it in form of a bran mash.

Maize is suitable for all stock, but on account of its hardness not so easily digested as other grain, and therefore preferably fed in ground form as **maize meal.** Maize, of all the cereal seeds, contains the least amount of lime, and its proteins are very deficient in lysine. Maize is chiefly a heat and fat producing food.

It is of interest to note that the protein content of maize has been gradually decreasing year by year in Queensland. Twenty-three years ago a large number of different varieties of maize were analysed and found to contain high amounts of crude protein, averaging 13.5 per cent., and ranging from 12.1 to 13.8 per cent. An imported maize from the Argentine, containing 10.7 per cent. of crude protein, gave, after being grown on our State farms, 12.9 per cent. At that time I claimed our Queensland-grown maizes to practically equal wheat as a food for poultry, &c. Since that time, however, a change has taken place, and the average of many samples analysed during the last three years was only 9.5 per cent. of crude protein, varying between 8 and 13 per cent. It is quite evident that our present maize is more valuable as a material for the production of cornflour and glucose, or production of power alcohol, than as a stock food. Maize grown for stock-food purposes should be from specially selected seeds rich in protein. Of a very high food value are the by-products from maize, viz., maize germ meal, polly meal, maize gluten meal, &c., which were on the market some years ago, but are at present not procurable, as they are eagerly bought up in the States where the factories utilising maize exist.

Leguminous Seeds.

Beans, peas, cowpeas, &c., are very nutritious food, containing large amounts of protein, and can be used for all stock. If fed in large amounts they may cause constipation and also thickening of the blood, and therefore should not form more than one-fifth to one-quarter of the grain ration. Leguminous seeds should be given either ground, crushed, or soaked. A few species of leguminous seeds, like Java bean; are poisonous, containing a hydrocyanic yielding glucoside.

Oily Seeds.

Linseed, slightly crushed, is an excellent calf food, as it contains a large amount of fat. The by-product from the manufacture of linseed oil—the linseed cake—is one of our most valuable concentrated stock foods, but unfortunately the quality of linseed imported for the manufacture of oil is very much lower in its protein content than the linseed used in Europe, our linseed containing only 18 per cent. of crude protein, as compared with 24.2 per cent., the average in England. Again our cake contains only 25.5 per cent. of protein, as compared with European cake containing from 29.5 to 35 per cent.

Linseed cake used to contain from 9 to 10 per cent. of fat, and this made it valuable as a calf food to replace the fat lost in the milk on separating, but a new process of manufacture brings the oil contents down to 2 per cent. and less, and makes the cake of much less value for calf feeding. All linseed contains more or less of a hydrocyanic acid

yielding glucoside, and must be therefore used with caution and never fed in excess. Several cases of death among calves have been reported, due to giving excessive amounts of linseed meal.

Sunflower Seeds and **Sunflower Oil Cake,** if procurable, are excellent foods, suitable for all kinds of stock.

Peanuts or **Earthnuts** are a suitable feed for cattle, sheep, and pigs. If given in excess to pigs they produce soft fat and inferior pork.

Peanut Cake is the richest of all our oil cakes. The vines of the peanuts may be collected and cured into a nutritious palatable hay. Peanut hulls ground are frequently used for the adulteration of stock foods; they have very little food value, on account of the high amount of fibre.

Cotton Seed is always used in Queensland in form of cotton seed meal, after extraction of the cotton seed oil. If the hulls are not removed before crushing **undecorticated meal** is obtained, which is of much less value than the **decorticated meal,** which contains no hulls. Undecorticated meal, on account of the indigestibility of the hulls, is a most constipating food, and therefore used with advantage when feeding very lushy grasses, whereas decorticated meal is a valuable concentrate, suitable for cattle and sheep, but **not for pigs.** It is a good milk-producing food, and also good for fattening cattle and sheep, fed in moderate amounts.

Coconut Cake or **Copra Cake.**—The by-product of the manufacture of coconut oil is a very palatable and pleasant-smelling concentrated food, suitable chiefly for dairy cows, but also for general use for cattle, sheep, and pigs. The coconut cake should be soaked before being used, as it swells very considerably on absorption of water. When fed to dairy cows it helps to produce a good firm butter, whereas linseed meal tends to soften the butter, and cotton seed meal again produces a hard tallowy butter, of light colour and poor flavour.

Other By-products and Various Foods.

Meat Meal.—The by-products of meatworks sold under various trade names, as meat meal, dried liver, and lights, bovaline, mutton protein, protein meal, ox-a-vita, &c., are valuable concentrated stock foods, and small amounts can form part of the rations for dairy cows, pigs, and poultry. Meat meal particularly promotes growth, as already explained.

Fish Meal is a very valuable nutritious food obtained as a by-product in the process of curing and canning fish. It should contain about 50 to 56 per cent. of protein and not more than about 4 or 5 per cent. of oil. If too much oil is left in the meal this food would give a pronounced fishy taint to the flesh, fat, and milk of the animals fed with such meal. Fish meal contains about 20 per cent. of ash, chiefly phosphate of lime, and is therefore of particular value as a pig feed, used, of course, in small amounts, from 1 to 3 oz. per head according to age and size.

Cod Liver Oil is an easily digested fish oil of high nutritious value, particularly rich in vitamins and therefore used for young animals to promote a healthy growth. It is of particular value, given in small quantities to calves reared without milk or skim milk.

Blood Meal made from dried blood is another highly concentrated food, of similar use as meat meal. Ordinary dried blood, in coarse granular form, should never be used as stock food, as on account of the high nutritious qualities, inflammation of the stomach lining sets in where the hard grains come in contact. Serious injuries to pigs and poultry have been caused when feeding such coarse dried blood. Proper blood meal for stock food should be as fine as flour, and is highly digestible, and therefore should be used in small quantities only, well mixed with other foods.

At the Yeerongpilly Stock Experiment Station, when carrying out feeding experiments with sheep, we found that of the crude protein in somewhat coarse blood only 61 per cent. was digested, whereas in the fine blood meal 89 per cent. was digested.

Molasses, the by-product of the manufacture of cane sugar, is palatable and much relished by stock. The feeding value consists entirely of soluble readily digested sugars, and molasses is therefore a heating and fat-producing food and supplies no protein whatever. Amounts from 2 to 3 lb. daily can be given to horses and cows, sprinkled on roughage, which is made more palatable. Molasses act as an antidote against hydrocyanic acid poisoning, and therefore foods like young sorghum, Sudan grass, and sweet potato vines, which may contain a hydrocyanic acid yielding glucoside in dangerous amounts, should be sprinkled with molasses before being fed to stock.

One of the newer concentrated foods on the market abroad is **Dried Yeast,** a by-product of breweries and other fermentation industries. As soon as power alcohol factories are properly established, this valuable product will become available. Dried yeast contains about 50 to 55 per cent. of protein, no oil, about 30 per cent. carbohydrates, and 10 per cent. ash. It also contains a large amount of vitamins, and is of great value as a food for pigs, but, like all other foods very rich in protein, must be given in small amounts mixed with other foods, in quantities from 1 to 3 oz. per head.

Compressed Concentrated Foods.—Hand feeding of sheep, more especially of large mobs of starved animals, has always been a big problem, as it is almost impossible to provide sufficient troughing to give all animals an equal chance, and the weak ones have generally to go without food. The use of troughs also leads to bolting of food and general waste. As sheep can pick up grain from the ground as well as poultry, our sheep expert, Mr. W. Brown, recommends to dribble grain like maize and barley in a thin line on the circumference of large circles, which gives every sheep a chance to pick up a few grains. At present compressed concentrates are on the market which are particularly suited for hand feeding of sheep. Amongst the available foods we find linseed nuts, cotton seed, treacle cubes, and kubettes for sheep. These nuts should not be too large (cubes from $\frac{1}{2}$ to $\frac{3}{4}$ inch) and should if possible be made from a mixture of various grains, meals, and by-products in order to give the animals a variety of proteins, so beneficial to the general health. Amongst the available foods are linseed nuts (a form of linseed cake broken up into small pieces of suitable size for feeding of sheep), cotton seed, and treacle cubes. Each of these products is made from a single by-product, and contains rather too high an amount of protein, whereas kubettes are made from a very large number of products containing an amount of protein equal to ordinary cereal grain, and are undoubtedly the most suitable food for

hand feeding of sheep at present on the market. The manufacture of such compressed concentrates should be very much extended, and if offered at reasonable cost will lead to large consumption throughout the year, because there are many localities where the addition of a little concentrate in certain seasons would be highly beneficial to grazing sheep.

Licks.—In many districts the supplying of licks containing **salt, lime,** and **phosphates** to stock is an absolute necessity, and nearly everywhere such licks can be given to benefit the health of the animals.

Fine Bone Meal can be mixed with coarse salt and forms a good lick, as long as care is taken that the bone meal is of good quality and specially sterilised by heating with super-heated steam. Ordinary bone meal as used as fertilizer should on no account be used. A good substitute for bone meal, supplying large amounts of lime and phosphoric acid, is **finely-crushed Nauru or Ocean Island phosphate.***

The licks should always be placed in sheltered troughs, preferably of the continuous self-feeding type recommended by our Department. A mixture of equal parts of coarse salt and phosphate makes a cheap effective lick. Small amounts of sulphur, adding, say, 2 lb. of flowers of sulphur to every 100 lb. of salt and phosphate mixture, will be found beneficial. An addition of the same amount of carbonate of iron, or of sulphate of iron, will improve the health of stock in many districts.

As the use of licks, as recommended, has already given excellent results in many localities, I will herewith give a few of such mixtures.

For sheep—

2 bags (187 lb.) Nauru phosphate,
1 bag (187 lb.) coarse salt,
20 lb. Epsom salts, well mixed together.

When feeding in very dry areas with constipating coarse grass or hay the amount of Epsom salts can be increased to 50 lb. If sheep are supplied with very saline water, the amount of salt given in the lick must be cut out or very much reduced.

For cattle similar licks can be used, but some owners prefer bone meal; only finely-ground steamed bone meal of the best quality should be used, and mix—

200 lb. of bone meal,
100 lb. coarse salt.

Anyone desiring a complete medicated lick for cattle or sheep can use the following:—

200 lb. steamed bone meal, or crushed Nauru phosphate,
100 lb. coarse salt,
50 lb. finely ground limestone,
15 lb. Epsom salts,
5 lb. sulphate of iron,
5 lb. flowers of sulphur,
4 oz. iodide of potassium.

A good lick for pigs is the following mixture:—

20 lb. hardwood ashes and charcoal,
15 lb. finely crushed limestone,
40 lb. steamed bone meal,
20 lb. coarse salt.

---

*Reports of ill effects supposed to be caused by feeding of Nauru phosphate are absolutely without foundation. Continued heavy use of Nauru phosphate licks for over six years on several stations gave excellent results.

Another lick for pigs, recommended by the Staffordshire farmers, is made as follows:—

35 lb. coarse salt,
15 lb. flowers of sulphur,
15 lb. steamed bone meal,
20 lb. crushed limestone,
15 lb. wood ashes with charcoal,
5 oz. potassium iodide.

"The Stock Foods Acts, 1919 to 1928."

Quensland possesses in the Stock Foods Acts a piece of advanced legislation for the protection of all buyers of stock foods, which is far ahead of any similar Act in other Australian States, and quite up to the standard of such Acts existing abroad. This legislation, which at first met with some opposition on the part of the sellers, as it was considered to harass trade unnecessarily, is now welcomed by genuine manufacturers and dealers as a protection against unfair competition by unscrupulous traders, and puts the manufacture and sale of all stock foods on a sound basis.

Under the Act all wholesale sellers of any mixed concentrated or prepared stock food, which includes all kinds of meals and foods for stock prepared in whole or in part from one or more than one kind of grain or oils or juices of meats or other source, and any condimental patented or proprietary stock food claimed to possess nutritive as well as medicinal properties, must every year submit samples of such foods to the Under Secretary, and at the same time state the composition and food value of such samples. Certain stock foods must be labelled, stating on the labels the number of net pounds in the package, the distinguishing name or trade mark of the food, name and address of seller, and chemical analysis of the food, giving minimum amounts of crude protein and crude fat, and maximum amount of crude fibre. The seller must give at the time of sale an invoice certificate, giving among other things the gross weight, warranty about composition and amounts of foreign ingredients, &c. Upon the sale of hay, straw, and chaffs made therefrom, and mixed chaff, the invoice must specify each component and in case of mixed chaff and straw chaff the package must be labelled M.C. and S.C. respectively. Unfortunately the great majority of our stock food buyers pay but little attention to labels and invoice certificates, which are frequently torn up and thrown away, and therefore do not derive the full benefit of the Stock Food Acts. The monetary value of any stock food can be enormously influenced by variation in the amount of protein and fat contained in the food, and therefore the stockowner, poultry farmer, &c., should carefully study the labels of various samples and compare them with the prices, in order to buy most economically.

It must be clearly understood that the feeding value of any food cannot be entirely judged by its analysis; other factors as palatability, composition of the protein, vitamin contents, freedom from impurities, &c., must be taken into consideration, besides its relative cost, and therefore the old saying that "**the master's eye is the best food**" will always remain true.

Feeding Standards.

For the guidance of the stockowner in choosing and making up suitable rations, based on the composition of the various stock foods, it is necessary to draw up feeding standards, stating the amounts of

each class of nutrient necessary to be provided in the rations for farm animals of all classes and ages, to keep them in best condition and obtain a maximum of production. During the last century many of such standards were drawn up by eminent men like Wolff, Atwater, Armsby, and Lehmann. Table III. gives the latest **standard rations** according to Dr. O. Kellner, the Director of the Mockern Experiment Station (Germany), based on the amounts of dry matter, digestible protein, and starch values required for the rations.

How to Make up Rations.

As a basis for the making up of rations we must take into consideration the fact that a ruminant can eat daily an amount of fodder which contains dry matter equal to 2½ to 3 per cent. of the body weight of the animal. This amount is for full-grown animals; for maintenance and at rest, only from 1½ to 2 per cent.; and for heavy milkers up to 3½ per cent. of the live weight.

Feeding of Cows.

A cow from 750 to 800 lb. live weight, yielding daily 2½ gallons of milk, would require, as calculated from Table III., per day a ration containing—

Dry Matter.	Digest Protein.	Starch Equivalent.
23 lb.	1·65 lb.	9 lb.

For convenience and rapid comparison of all stock foods, the last two columns (16 and 17) of Table I. show the amounts of stock foods in pounds required to supply 1.65 lb. of digestible pure protein and 9 lb. starch equivalent.

We will start a ration with **good lucerne chaff**—

——	Dry Matter.	Digest Protein.	Starch Equivalent.
25 lb. of lucerne chaff contains	22·6	2·58	7·45

which would supply an excess of nitrogen and not sufficient starch equivalent, which is quite apparent from columns 16 and 17, which show that only 16 lb. would be required to supply the necessary nitrogen and 30 lb. to supply the starch equivalent on account of the narrow nutritive ratio (column 12) of 1 ÷ 3.6, whereas we want a ratio of about 1 ÷ 5.

By reducing the amount of lucerne chaff and substituting the same amount of **wheat hay chaff** we get:

——	Dry Matter.	Digest Protein.	Starch Equivalent.
13 lb. of lucerne chaff	11·7	1·34	3·9
13 lb. of wheat chaff	11·4	0·19	3·8
	23·1	1·53	7·7

The amount of protein is lowered a little too much and we have not yet sufficient starch equivalent. We must reduce the amount of chaff and add a more starchy food like maize meal, and make up the following ration, which brings the ration up to standard.

	Dry Matter.	Digest. Protein.	Starch Equivalent.
13 lb. of lucerne chaff	11·7	1·34	3·9
10 lb. of wheat chaff	8·8	·15	2·9
3 lb. maize meal	2·6	·14	2·1
	23·1	1·63	8·9

If we start as basis of a ration with a good bush hay we find in:

—	Dry Matter.	Digest. Protein.	Starch Equivalent.
25 lb. good bush hay	23·0	·48	8·2

This ration is very deficient in digestible protein, and slightly deficient in starch equivalent.

If we replace 8 lb. of hay by 8 lb. of maize meal we obtain—

—	Dry Matter.	Digest. Protein.	Starch Equivalent.
17 lb. bush hay	15·6	·32	5·6
8 lb. maize meal	6·9	·37	5·6
	22·5	·69	11·2

The ration is still very deficient in protein, and too high in starch equivalent, maize being a one-sided starchy feed, and we must therefore substitute much more nitrogenous concentrates like cotton-seed meal or linseed meal.

—	Dry Matter.	Digest. Protein.	Starch Equivalent.
17 lb. bush hay	15·6	·32	5·6
4 lb. maize meal	3·5	·19	2·8
2 lb. bran	1·8	·23	·9
2 lb. cotton-seed meal	1·8	·67	1·3
	22·9	1·41	10·6

The ration is still rather low in digestible protein for a milking cow and a little high in starch equivalent. The bush hay is evidently too poor to form a suitable basis for the ration, and the amount of concentrated food should not be raised over one-third of the total ration. The ration would have been still very much poorer if a poor quality

bush hay had been used. The ration could be brought up to standard by increasing the cotton-seed meal to the maximum amount which can be safely given to a cow, making the ration as follows:—

—	Dry Matter.	Digest. Protein.	Starch Equivalent.
17 lb. bush hay	15·6	·32	5·6
3 lb. maize meal	2·6	·14	2·1
2 lb. bran	1·8	·23	·9
3 lb. cotton-seed meal	2·7	1·01	2·1
	22·7	1·70	10·7

All the rations so far mentioned are deficient in not containing any succulent food, which is so essential to milking cows.

An excellent ration could be made up with **maize silage** as a basis, and using such concentrates in addition which are at present the cheapest foods on the market:

—	Dry Matter.	Digest. Protein.	Starch Equivalent.
40 lb. maize silage	12·0	·24	5·6
8 lb. lucerne chaff	7·3	·82	2·4
3 lb. barley meal	2·6	·25	2·2
1 lb. cotton-seed meal	0·9	·34	0·7
	22·8	1·65	10·9

This ration is just a little high in starch equivalent, but otherwise correct.

Similar rations can be made up from any material on the farm, by using the table of analysis of foods.

Besides the method used above for the compounding of rations, and the method mentioned, where the fuel value of the foods can be utilised for such calculation, Henry and Morrison in "Feeds and Feeding" (Abridged) use a method in which the calculation is based on the amounts of digestible crude proteins and total digestible nutrients. A dairy cow of 1,000 lb. live weight requires—

—	Digest. Crude Protein.	Total Digestible Nutrient.
	Lb.	Lb.
For maintenance only	0·70	7·92
And in addition for each pound of milk of—		
3·0 per cent. fat	0·047—0·057	0·257—0·286
3·5 per cent. fat	0·049—0·061	0·284—0·316
4·0 per cent. fat	0·054—0·065	0·311—0·346

Based on this method of calculation, E. H. Gurney published in the April number of the "Queensland Agricultural Journal" a complete list of rations, using the various more common foodstuffs available. To make the work more complete and useful these rations are herewith given. It must be, however, clearly understood that the quantities given can only be approximate, as the composition of the roughage can show a variation.

A 1,000-lb. cow yielding 25 lb. of milk with 3.5 per cent. fat requires any of the following rations per day:—

(1) 40 lb. green sorghum,
60 lb. mixed pasture,
8 lb. lucerne chaff.

(2) 65 lb. green sorghum,
7 lb. lucerne chaff,
7 lb. maize meal.

(3) 45 lb. green sorghum,
13 lb. wheat chaff,
3 lb. bran,
2¾ lb. cotton-seed meal (decort.),
2 lb. molasses.

(4) 50 lb. green sorghum,
40 lb. cowpea vines,
3 lb. bran,
1¾ lb. cotton-seed meal (decort.),
4 lb. molasses.

(5) 42 lb. sorghum silage,
9 lb. lucerne chaff,
7 lb. maize meal.

(6) 35 lb. sorghum silage,
5 lb. lucerne chaff,
6 lb. wheat chaff,
2 lb. linseed oil meal,
3 lb. pollard,
3 lb. rice meal.

(7) 65 lb. green maize,
8 lb. lucerne chaff,
7 lb. maize meal.

(8) 54 lb. green maize,
10 lb. wheat chaff,
3 lb. maize meal,
3 lb. bran,
2¾ lb. cotton-seed meal (decort.).

(9) 30 lb. maize silage,
5 lb. good bush hay,
4 lb. cowpea chaff,
5 lb. maize meal,
3 lb. coconut cake,
1 lb. blood meal.

(10) 35 lb. maize silage,
8 lb. lucerne chaff,
7 lb. barley meal.

(11) 80 lb. green paspalum,
6 lb. lucerne chaff.

(12) 67 lb. green paspalum,
3 lb. maize meal,
3 lb. bran,
2 lb. cotton-seed meal (decort.).

(13) 100 lb. Sudan grass,
4½ lb. lucerne chaff.

(14) 100 lb. Sudan grass;
3 lb. bran,
1 lb. cotton-seed meal (decort.).

(15) 50 lb. Sudan grass,
8 lb. wheat chaff,
4 lb. lucerne chaff,
3 lb. maize meal,
2 lb. linseed oil meal.

(16) 20 lb. green oats,
8 lb. lucerne chaff,
10 lb. wheat chaff,
3 lb. coconut cake,
3 lb. molasses.

(17) 25 lb. green barley,
13 lb. wheat chaff,
6 lb. lucerne chaff,
2 lb. linseed oil meal,
3 lb. molasses.

(18) 60 lb. sugar cane tops,
10 lb. cowpea chaff.

(19) 50 lb. sugar cane tops,
30 lb. green cowpea,
5 lb. lucerne chaff.

(21) 35 lb. elephant grass,
35 lb. imphee,
8 lb. lucerne chaff,
5 lb. maize meal.

(21) 35 lb. elephant grass,
35 lb. imphee,
10 lb. pumpkins,
7 lb. lucerne chaff,
5 lb. maize meal.

(22) 65 lb. mixed pasture,
9 lb. lucerne chaff,
5 lb. maize meal.

(23) 15 lb. bush hay (poor),
10 lb. pumpkins,
5 lb. lucerne chaff,
7 lb. maize meal,
1 lb. blood meal.

(24) 65 lb. prairie grass,
5 lb. wheat chaff,
5 lb. maize meal,
1 lb. molasses.

Feeding of Horses.

When making up food rations for horses we must remember that the digestive organs of a horse differ from those of ruminants. A horse cannot digest such large amounts of coarse bulky food rations as given to cows, and as a rule only one-third of the amount of roughage given to a cow should be supplied to a horse. Hand-fed milking cows should

receive approximately one-third of the total dry of the ration in form of grain or concentrated foodstuffs, whereas to working horses one-half of the dry matter of the ration can be profitably given in form of grain or concentrates.

Valuable work with regard to horse feeding was done some years back by Professor A. J. Perkins in South Australia, paying particular attention to the "feeding value" prices of various foodstuffs in normal and abnormal seasons. Professor Perkins also collected data about the rations fed in old-established livery stables and city carriers, and it was interesting to note how closely the rations found to be most suitable by long continued practical experiences of these firms, agree with Kellner's standards.

Light horses (averaging 1,000 lb. live weight) doing mail and other fast road work received a daily ration of 24 lb. wheat hay chaff, 2 lb. bran, and 2 lb. pollard, and twice weekly from 6 to 8lb. of green lucerne.

Draught horses (1,400 lb. live weight) doing road and slow delivery work received 32 lb. wheat hay chaff, 8 lb. bran, and twice weekly 8 to 10 lb. of lucerne; an additional allowance of 4 to 6 lb. of crushed oats was given when doing long and heavy trips.

Another firm of carriers fed to medium draught horses (1,200 lb. live weight) a ration of 32 lb. wheat hay chaff and 5 lb. of bran, with an additional 5 lb. of oats in the winter months. When chaff became too expensive, they used with good results a ration consisting of 25 lb. of wheat hay chaff and 10 lb. crushed maize.

Feeding of Pigs.

The general rules laid down for feeding of stock apply to pigs, and there are no farm animals (the milking cow excepted), which put their food to better use than pigs. The aim of the pig farmer should be to produce as much growth as possible in the shortest time, and for this reason the ration for the young growing pig should be more nitrogenous, with a narrow nutritive ratio of about $1 \div 4$. The amount of carbohydrates may be increased as the pigs grow older, and more so in the fattening period.

Lucerne is one of the best foods for pigs, and a field of lucerne is the only pasturage where pigs can be raised without any other food. As already pointed out, young growing pigs should, if possible, obtain some of the protein from an animal source, and for this reason skim milk is of particular value as part of a ration for pigs. Ground barley, where obtainable at reasonable cost, is another staple food for pigs.

A standard ration for ten young pigs of about 50 lb. average live weight would consist of 6 lb. pollard, 10 lb. ground barley, 4 lb. lucerne hay (chaffed) soaked in 4 gallons of skim milk. The 4 lb. of lucerne hay could be replaced by about 18 lb. of fresh cut green lucerne.

In cases where no lucerne is available more grain may be used, giving a ration consisting of 11 lb. pollard, 7 lb. crushed maize, 2 lb. linseed meal, with 4 gallons of skim milk.

As succulent foods sweet potatoes, swedes, sugar mangels, pumpkins may be used. Separated or skim milk can be replaced by buttermilk.

With the ruling high prices which have to be paid for pollard and all concentrates, the standard rations above mentioned could not possibly be profitable and would have to be modified by utilising to a

large extent succulent crops grown on the farm. From one-third to one-half of the ration must be made up from root crops, green crops like sorghums, rape, &c.

The importance of growing only such varieties of root crops which are particularly rich in nitrogenous matter is quite apparent, and the cultivation of sugar mangels already alluded to, containing three times the amount of nitrogen found in ordinary mangel, should be encouraged in all localities where it can be successfully grown.

The success of any pig farm will depend entirely on the quality and quantity of the food grown on the farm.

Feeding of Poultry.

Practical experience has taught the poultry farmer that laying hens require a ration fairly rich in nitrogenous nutrients, part of which should be of animal origin. A nutritive ratio from $1 \div 4\frac{1}{2}$ to $1 \div 5$ has proved successful.

Hens of a heavy type require comparatively less food than the more energetic lighter types.

According to Professor Wheeler, of the New York State Station, hens in full laying require:—

	Digestible Nutrients per Day per 100 Lb. Live Weight—			
	Total Dry Matter.	Protein.	Fat.	Carbo-hydrate.
	Lb.	Lb.	Lb.	Lb.
Hens from 5 to 8 lb. weight	3·30	0 65	0·20	2·25
Hens from 3 to 5 lb. weight	4·50	1·00	0·35	3·75

In accordance with these amounts the daily ration for 100 laying hens, of light weight, should consist of 16 to 18 lb. dry matter, 2.50 to 3.0 lb. protein, 0.5 to 1.0 lb. of fat, and 10.0 to 11.5 lb. of carbohydrates.

Hens can only digest a very small amount of crude fibre, and this fact must not be lost sight of when chossing the most suitable grain for feeding, and for this reason oats are not so suitable as wheat or barley.

Of importance is a plentiful supply of mineral matters, containing lime and phosphoric acid, and grit and charcoal to aid in digestion.

A few standard rations to supply a liberal amount of food required by 100 hens of an average weight of 4 to 5 lb. per day can be made up as follows:—

I.	II.	III.
9 lb. wheat	11 lb. wheat	1 lb. wheat
5 lb. pollard	3 lb. bran	3 lb. bran
5 lb. bran	4 lb. pollard	5 lb. crushed barley
15 lb. ($1\frac{1}{2}$ gall.) skim milk	2 lb. lucerne meal	$5\frac{1}{2}$ lb. copra cake
	1 lb. meat meal	$5\frac{1}{2}$ lb. lucerne meal.

An occasional change of the constituents of any ration is generally beneficial, but any change must be made very gradual, as with a sudden change of food fowls may refuse to eat it.

The amount of food required by growing chicks, per 100 lb. live weight, is much greater than the amount for fowls above mentioned. Pullets weighing about 1 lb. require just double the amount of food than given to hens of light weight.

At the present time dry mash feeding from suitable hoppers has become popular, and is very successful where a large number of fowls are kept. A good dry mash is made up as follows:—Four parts (by measure) of bran, one part each of pollard, ground oats, ground barley, corn meal, beef scraps, with ½ lb. of salt for one bag of the mixture.

Any other grain or seed, like Kaffir corn, sorghum seed, sunflower seed, panicum, canary seed, peas, beans, &c., may be substituted for other seeds, if obtainable at reasonable cost, always bearing in mind that the seeds, as feed for fowls, must be chiefly judged by their protein content, and not so much by number of food value.

In conclusion, I must point out that the figures given for the compounding of rations cannot be followed implicitly in all cases, but a certain latitude must frequently be allowed.

The objects of this pamphlet are chiefly the spreading of knowledge with regard to stock foods in general, to eliminate errors in feeding, and more particularly to draw attention to some of the foods hitherto neglected, which can take the place of other more expensive foods. In nearly all cases practical experience is a valuable guide, but whenever possible combine "Practice with Science."

TABLE I.

Composition of Stock Foods.

—	Crude Nutrients Per Cent. Moisture.	Protein.	Fat.	Carbohydrates.	Fibre.	Ash.	Digestible Nutrients Per Cent. Crude Protein.	True Protein.	Fat.	Carbohydrates.	Fibre.	Nutritive Ratio 1 ÷	Value Number per cent.	Per 100 Lb. Production Starch Equivalent.	Food Units.	Lb. of Fodder to Supply. 1·65 lb. Protein.	9·0 lb. Starch Equivalent.
Green Fodders.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
I. Grasses and Cereals—																	
Barley, in flower	79·0	2·7	0·6	8·0	7·9	1·8	1·8	1·5	0·4	6·0	4·3	7·3	80	9·9	15·5	110	91
Buffalo grass	78·0	2·1	0·5	12·3	4·6	2·5	1·4	1·2	0·3	8·8	2·9	10·3	80	10·7	15·8	138	84
Canary grass	76·5	2·8	0·6	12·1	5·8	2·2	1·8	1·5	0·4	8·6	3·2	10·9	80	14·2	20·8	110	64
		(2–3)															
Couch grass	74·1	4·1	0·4	10·0	8·4	3·0	3·0	2·0	0·2	7·0	4·9	6·2	85	12·1	19·8	83	74
Flinders grass ..	68·0	1·8	0·4	11·3	14·0	4·5	1·2	1·0	0·2	7·8	8·0	16·2	76	13·0	19·2	165	69
		(1·2–2·5)															
Foxtail millet (*Setaria italica*)	87·0	1·3	0·2	6·2	4·1	1·2	0·7	0·4	0·1	3·8	2·2	15·5	82	5·4	8·0	412	167
		(1·0–2·0)															
†Guinea grass (*Panicum maximum*)	80·0	2·6	0·5	9·4	12·0	3·5	1·6	1·0	0·3	7·6	7·0	15·2	80	12·9	19·2	165	70
		(0·7–3·5)															
Indian cane	77·0	1·5	0·2	11·0	8·9	1·4	1·0	0·7	0·1	7·9	5·2	19·0	80	11·2	15·8	236	80
Maize	82·0	1·7	0·5	9·0	5·6	1·2	1·0	0·6	0·3	6·0	3·1	16·2	83	8·7	12·2	286	104
Mitchell grass.. ..	74·0	1·4	0·4	9·3	11·3	3·6	0·9	0·5	0·2	7·5	6·2	28·2	76	11·1	16·4	330	81
		(1–2·1)															
Mixed pasture, poor ..	80·0	0·7	0·2	7·5	9·0	2·6	0·5	0·3	0·1	5·4	5·2	35·4	86	9·4	11·9	550	95
Mixed pasture, average	80·0	1·3	0·3	7·8	8·2	2·4	0·9	0·5	0·2	5·8	5·0	22·4	90	10·5	13·5	330	86
Mixed pasture, best ..	80·0	2·5	0·8	8·5	6·0	2·2	1·6	1·3	0·4	6·3	3·6	8·2	92	10·8	14·6	127	83
Oats, in flower ..	76·8	1·9	0·6	10·4	8·5	1·8	1·4	1·2	0·4	6·5	4·9	10·1	75	9·9	15·6	138	91
Panicum frumentosum	76·0	1·5	0·5	12·0	6·0	4·0	1·0	0·6	0·3	8·5	3·6	21·2	80	10·7	15·2	286	84

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Paspalum	75·0	2·3 (1·2–4)	0·4	8·9	10·4	3·0	1·5	1·2	0·2	7·0	6·2	11·7	80	11·8	17·4	138	76
Prairie grass	76·8	4·6 (2·7–6·4)	0·8	8·5	6·7	2·6	3·0	2·2	0·4	6·6	4·3	5·3	86	11·7	19·1	75	77
Rhodes grass	75·0	1·8 (1·5–3)	0·4	10·0	10·3	2·5	1·3	1·0	0·2	6·8	6·0	13·2	80	11·3	16·5	165	80
†Sorghum (saccharine)	80·0	2·1 (1·7–2·7)	0·6	9·7	6·2	1·4	1·2	0·7	0·2	5·8	3·3	13·6	79	8·1	12·5	236	111
Summer grass ..	72·0	1·4	0·3	13·1	10·0	3·2	0·9	0·5	0·1	9·3	6·0	31·0	85	13·6	17·8	330	66
†Sudan grass	78·0	2·3	0·2	11·0	6·2	2·3	1·5	1·1	0·1	7·5	3·8	10·5	82	10·2	15·3	150	88
Sugar-cane tops ..	72·0	2·6	0·7	12·9	10·0	1·8	1·7	1·2	0·3	9·4	6·5	13·7	80	14·1	20·8	136	64
Water couch (*Paspalum distichum*)	77·0	1·8 (1·4–2·3)	0·3	10·7	7·5	2·7	1·4	1·1	0·1	7·1	5·0	11·2	82	10·9	15·8	150	83
Legumes—																	
Cowpea vines ..	78·0	2·3 (1·7–3·6)	0·6	10·7	5·5	2·9	1·6	1·2	0·3	7·3	2·8	8·9	77	9·1	14·7	136	99
Field pea, in flower..	83·2	3·5	0·6	5·6	5·9	1·2	2·4	1·6	0·3	3·7	3·0	4·6	77	6·8	13·3	103	132
Lucerne, young ..	81·1	5·6	0·8	6·2	4·4	1·9	4·3	2·7	0·4	4·7	2·0	2·8	87	8·8	19·3	61	102
Lucerne, in flower ..	76·0	4·5	0·8	9·6	6·8	2·3	3·2	1·7	0·4	6·3	2·9	5·9	79	9·2	18·0	97	98
Trefoil (Medic burr)	78·6	4·3	0·5	10·8	3·0	2·8	3·0	1·5	0·2	7·4	1·6	6·3	80	8·8	16·9	110	102
Wild lucerne (*Stylosanthes mucromata*)	76·0	4·3	0·3	9·7	7·7	2·0	3·0	1·5	0·1	6·4	3·8	6·9	80	9·4	17·9	110	96
2. ROOTS, TUBERS, &c.—																	
Canna edulis (Queensland arrowroot)	76·8	0·3	0·1	20·5	0·7	1·6	0·2	0·1	..	18·5	..	184	100	18·6	18·9	1,650	48
Carrot	83·0	1·0 (0·6–1·2)	0·2	11·9	1·6	2·3	0·7	0·3	0·1	11·0	0·9	41	87	10·6	14·0	550	85
Kohl rabi	84·6	1·2 (0·8–2·0)	0·1	9·7	3·0	1·4	0·5	0·2	..	8·8	1·5	51	90	9·4	11·6	825	96
Mangolds	85·0	1·2 (0·5–1·7)	0·1	10·0	2·3	1·4	0·7	0·1	..	9·0	1·1	101	70	7·1	11·9	1,650	127
Melon, pie	94·0	0·7	0·2	3·3	1·4	0·4	0·5	0·2	0·2	3·9	0·8	25	90	4·8	6·7	825	188
Potato, English ..	75·5	2·1	0·1	20·4	0·9	1·0	1·1	0·2	..	18·4	..	92	100	18·6	21·1	825	48
Potato, sweet ..	70·8	1·9 (0·5–2·8)	0·2	25·3	0·8	1·0	1·0	0·2	..	23·0	..	115	100	23·2	25·5	825	39
Pumpkins	83·0	2·2	0·9	9·0	3·1	1·6	1·5	1·0	0·6	8·0	1·6	11	85	9·7	17·7	165	93

TABLE I—*continued.*

Composition of Stock Foods—*continued.*

—	Crude Nutrients Per Cent.						Digestible Nutrients Per Cent.							Per 100 Lb.		Lb. of Fodder to Supply.	
	Moisture.	Protein.	Fat.	Carbohydrates.	Fibre.	Ash.	Crude Protein.	True Protein.	Fat.	Carbohydrates.	Fibre.	Nutritive Ratio 1 ÷	Value Number per cent.	Production Starch Equivalent.	Food Units.	1·65 lb. Protein.	9·0 lb. Starch Equivalent.
Green Fodders.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2. Roots, Tubers, &c.—*continued.*																	
Sugar Beet	77·0	1·3	0·1	17·8	1·8	2·0	1·0	0·3	..	17·5	0·7	61	75	13·9	20·7	550	75
Swede, purple top ..	86·0	1·0	0·1	10·1	1·6	1·2	0·6	0·2	..	9·7	0·8	52	85	8·9	12·0	825	101
		(0·8–1·3)															
Turnip. Scotch, yellow top	89·5	1·0	0·1	6·7	1·6	1·1	0·6	0·2	..	6·4	0·6	35	77	5·5	8·5	825	164
		(0·6–1·2)															
3. Various—																	
Cabbage	89·0	1·5	0·4	5·9	2·0	1·2	1·1	0·7	0·2	4·6	1·4	9·2	94	6·7	9·1	236	134
Mustard	85·1	3·9	0·5	5·1	3·0	2·4	2·5	1·8	0·3	3·5	1·6	3·2	90	6·7	11·9	92	134
		(2·5–4·5)															
Prickly-pear	86·5	0·4	0·1	8·8	1·8	2·4	0·2	0·2	..	4·0	0·5	23·0	85	3·6	5·0	825	250
Rape	86·0	3·5	0·7	4·2	3·5	2·1	2·6	1·9	0·4	2·9	1·9	2·9	87	6·4	12·1	87	140
Saltbush	67·8	5·0	0·7	14·8	6·6	5·1	2·6	1·5	0·3	9·8	2·6	8·7	60	8·6	19·5	110	105
		(4–6)															
Sheeps Burnett ..	76·3	4·4	0·7	9·0	6·2	3·4	2·4	1·3	0·3	6·0	2·5	7·0	70	7·2	15·1	127	125
		(3–3·5)															
†Sweet potato vines ..	85·6	2·0	0·7	6·3	2·8	2·6	1·0	0·6	0·2	5·2	1·8	12·3	80	6·4	9·9	286	141
Turnip, Swede } leaves ..	88·4	2·2	0·5	5·3	1·5	2·1	1·5	0·4	0·2	4·2	0·8	13·5	93	5·4	9·1	413	167

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4. SILAGE—																	
Maize	70·0	1·9 (1·5–2·6)	0·7	15·5	9·2	2·7	1·0	0·6	0·3	10·7	5·2	27·5	82	14·0	19·0	286	64
Sorghum	74·3	1·8	0·4	10·4	8·9	2·2	·9	0·5	0·2	7·3	4·9	28·6	78	11·5	16·6	330	78
Sugar-cane tops ..	78·0	1·3	0·6	9·4	8·0	2·7	·6	0·3	0·2	6·6	4·0	55	80	15·1	18·0	550	60
Wheat, thistles, and mustard	65·0	4·6	1·2	13·5	11·9	3·8	2·2	1·2	0·6	9·5	6·5	9·8	80	10·4	17·3	136	87
Dry Fodders.																	
5. HAY AND CHAFF—																	
Barley	9·5	10·4	2·2	37·2	31·8	8·9	4·8	3·4	0·8	23·2	18·0	12·6	66	30·5	54·9	49	2)
Bush hay, good ..	7·5	6·1	1·9	38·6	39·8	6·1	2·8	1·9	0·6	24·0	22·6	25·2	66	32·8	54·9	87	27
Bush hay, poor ..	6·5	2·8	1·1	36·6	45·3	7·3	1·4	0·7	0·5	18·5	20·2	56·8	50	20·3	43·3	236	54
Cowpea, chaff ..	8·1	15·7	4·3	31·5	26·6	13·8	11·2	6·8	1·9	19·0	13·5	5·3	67	28·6	64·2	24	31
Lucerne, before flowering	8·2	21·0	2·8	31·4	25·9	10·7	15·7	10·5	1·3	21·2	11·8	3·4	63	28·7	75·0	16	31
Lucerne, in full flower	10·0	15·0	2·8	33·2	31·0	8·0	10·3	6·6	1·3	20·3	13·9	5·6	57	24·6	62·7	25	37
Lucerne chaff, poor ..	10·0	16·6	0·9	39·3	25·2	8·0	11·3	7·3	0·4	24·4	11·3	5·0	57	24·8	64·8	23	36
Lucerne chaff, good ..	8·0	20·7	1·4	40·9	20·0	9·0	15·5	10·3	0·7	27·7	8·4	3·6	63	29·8	76·4	16	30
Wheat	10·0	9·4 (6–10)	0·8	47·4	27·6	7·8	5·2	3·6	0·4	27·6	14·6	9·2	67	24·4	46·0	46	37
Wheat chaff	12·0	4·7 (4–6·5)	1·7	42·0	30·4	9·2	2·1	1·5	0·9	26·1	16·1	28·1	67	29·2	47·4	110	31
6. STRAW																	
Barley	8·5	3·5	2·0	38·4	41·0	6·6	1·0	0·7	0·8	20·2	22·0	62·5	46	20·5	46·2	236	44
Oats	9·2	4·0	2·3	42·4	37·0	5·1	1·5	1·2	0·7	19·4	21·0	34·8	43	18·4	45·5	136	49
Wheat	8·3	2·9	1·2	42·6	39·0	6·0	0·2	0·1	0·4	15·6	19·5	36·0	32	11·5	36·4	1,650	78
7. GRAINS, &c.—																	
Barley	14·0	8·6	1·5	71·0	2·7	2·2	6·5	5·9	1·2	65·0	1·6	11·7	98	73·2	85·4	28	12
Beans	14·3	25·4	1·5	48·5	7·1	3·2	20·1	19·3	1·2	44·1	4·1	2·6	97	66·7	101·1	9	14
Canary seed	11·5	15·2	5·4	57·7	5·1	5·1	11·5	10·6	4·3	48·7	2·9	5·6	97	69·6	88·4	16	13
Cowpeas	14·8	20·8	1·4	55·7	4·1	3·2	16·5	15·8	1·1	50·5	2·4	3·5	97	68·0	96·5	10	13
Kaffir corn	9·3	9·9	1·4	74·9	1·5	3·0	7·3	6·8	0·9	56·2	0·8	8·7	95	62·0	77·2	24	15
Linseed	7·9	18·2	38·6	20·0	12·1	3·2	14·6	13·6	32·8	16·0	1·0	7·0	98	107·5	132·3	12	8
Maize	13·0	9·5 (8–13)	4·0	69·3	2·8	1·4	6·7	6·2	3·5	65·8	1·8	12·1	100	80·8	91·8	28	11
Millet (foxtail) ..	12·8	10·9	2·9	55·2	14·3	3·9	8·3	7·7	2·1	41·5	1·3	6·1	95	51·6	68·0	22	17
Millet, Japanese ..	11·5	12·6	4·8	60·8	8·6	3·7	10·2	9·1	3·7	45·7	1·2	6·0	95	60·1	80·2	18	15

TABLE I.—*continued.*

Composition of Stock Foods—*continued.*

	Crude Nutrients Per Cent.						Digestible Nutrients Per Cent.							Per 100 Lb.		Lb. of Fodder to Supply.	
	Moisture.	Protein.	Fat.	Carbohydrates.	Fibre.	Ash.	Crude Protein.	True Protein.	Fat.	Carbohydrates.	Fibre.	Nutritive Ratio 1 ÷	Value Number per cent.	Production Starch Equivalent.	Food Units.	1·65 lb. Protein.	9·0 lb. Starch Equivalent.
Dry Fodders—*continued.*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
7. Grains, &c.—*continued.*																	
Oats	13·3	10·3	4·8	58·2	10·3	3·1	8·0	7·2	4·0	44·8	2·6	7·8	95	59·5	75·8	23	15
Sorghum	12·8	8·9	3·6	70·8	2·0	1·9	4·6	4·1	2·8	60·6	1·2	16·5	98	70·0	79·2	40	13
Sunflower	8·6	16·3	21·2	21·4	29·9	2·6	14·7	12·8	20·2	15·4	11·0	5·9	92	80·0	111·7	13	11
Wheat, plump ..	13·4	12·8 (7·5–16·6)	2·0	67·7	2·4	1·7	10·8	9·5	1·3	62·2	1·1	6·9	95	71·1	93·0	17	13
Wheat, shrivelled ..	11·1	16·5	3·0	63·6	3·5	2·3	13·9	12·3	1·9	58·5	1·7	5·2	95	71·9	98·8	13	13
8. Oilcakes and Meals and By-products—																	
Barley branning ..	10·5	14·0 (11–15)	3·8	57·3	10·1	4·3	11·9	10·8	3·2	45·0	3·1	5·1	96	62·3	84·6	15	14
Barley meal	11·7	12·4 (10–13·5)	1·0	67·1	5·3	2·5	9·4	8·5	0·8	61·0	3·0	7·7	98	72·2	89·2	19	12
Bran	10·6	15·8 (13–18)	2·6	56·3	9·8	4·9	12·3	11·6	1·8	40·5	3·3	4·1	77	45·0	78·0	14	20
Brewers' grain, wet ..	73·0	7·5	2·0	10·1	6·0	1·4	5·5	5·2	1·6	6·2	2·4	2·3	86	14·6	25·8	32	62
Coconut cake ..	12·8	17·2	7·5	46·7	10·5	5·3	13·5	13·0	7·2	39·8	6·6	4·9	100	75·9	102·5	13	12
Corncobs, ground ..	8·4	2·5	0·7	54·7	32·0	1·7	0·5	0·3	0·6	26·3	18·3	153	50	23·1	47·1	550	39
Cotton-seedmeal, decort.	9·0	41·0	7·0	29·0	8·0	6·0	35·3	33·7	6·6	19·5	2·2	1·1	97	67·2	125·9	5	13
Cotton seed	9·4	19·5	19·0	24·9	22·6	4·6	13·3	12·5	16·5	12·8	16·8	5·5	90	40·7	100·4	14	22

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Cotton-seed, meal undecort.	9·0	24·0	5·0	35·0	22·0	5·0	17·1	16·2	4·5	18·0	4·0	2·0	84	40·3	75·6	10	22
†Linseed meal (crushed linseed)	7·9	18·2	38·6	20·0	12·1	3·2	14·6	13·6	36·6	16·0	4·0	7·9	99	119·5	144·5	12	7½
†Linseed oil meal ..	9·8	25·5 (25–27)	8·0	39·2	11·0	6·5	22·0	20·9	7·4	31·4	4·5	2·6	96	70·4	108·7	8	13
Linseed meal (new process)	11·2	27·2	0·8	40·7	13·9	6·2	23·4	22·8	0·7	32·6	7·0	1·8	96	60·3	99·8	7	15
Maize meal	13·0	8·6 (8–12)	3·7	71·4	2·0	1·3	5·1	4·6	3·0	60·0	1·1	14·7	98	70·3	80·3	36	13
Malt sprouts (dried) ..	10·0	24·4	2·0	42·4	14·0	7·2	19·9	12·0	1·5	30·9	12·7	3·9	75	43·7	96·6	14	21
Millet meal	12·0	10·7	4·0	61·1	8·3	3·9	8·0	7·4	3·1	45·8	2·9	7·5	95	59·1	75·2	22	15
Peanut meal	10·7	47·6	8·0	23·7	5·1	4·9	42·8	41·4	7·2	20·2	0·4	0·9	98	75·2	144·9	4	12
Peanut cake undecort.	10·3	30·2	9·1	21·8	22·9	5·7	27·7	26·8	8·2	18·4	2·6	1·5	86	56·7	110·0	6	16
Pollard	10·4	15·7 (13·5–20)	3·6	61·4	5·8	3·1	13·8	11·9	3·1	54·0	2·1	5·3	86	63·6	97·1	14	14
Rice meal	10·1	11·5	11·3	55·0	4·6	7·5	6·7	5·9	9·5	50·1	2·3	12·2	96	74·8	89·2	28	12
9. VARIOUS FOODS—																	
Calf meal	10·6	16·2 (12–22)	7·2 (5–11)	55·9	4·5 (3–9)	4·6	13·1	10·0	4·5	45·0	4·0	5·9	86	58·3	91·3	17	15
Kubettes for sheep ..	10·0	13·8	3·1	59·5	8·3	5·3	11·0	7·5	2·8	42·0	4·5	7·0	86	51·1	79·9	22	18
Meatworks products— Blood meal ..	10·0	75·1 (71–78)	1·5	7·7	..	5·7	67·0	58·5	1·3	5·0	..	0·01	100	63·1	175·6	3	14
Meat meals ..	8·0	54·4 (46–66)	8·0 (2–14)	6·1	..	23·5	48·3	42·0	7·0	4·5	..	0·5	100	60·8	143·3	4	15
Milk, cow's, whole ..	87·2	3·6	3·7	4·8	..	0·7	3·4	3·4	3·7	4·8	..	4·0	100	16·9	22·2	49	53
Milk, butter-milk ..	90·8	3·6	0·8	4·1	..	0·7	3·4	3·4	0·8	4·1	..	1·8	100	9·2	14·5	49	98
Milk, butter, dried ..	7·0	34·5	1·1	49·1	..	8·3	32·5	32·5	1·1	49·1	..	1·6	100	82·3	132·9	5	11
Milk, separated ..	90·4	3·8	0·1	4·9	..	0·8	3·6	3·6	0·1	4·9	..	1·4	100	8·6	14·2	46	105
Milk, skim milk powder	6·0	32·7	1·6	52·0	..	7·7	31·0	31·0	1·6	52·0	..	1·8	100	85·0	133·3	5	10
Milk, whey	93·4	0·7	0·2	5·0	..	0·7	0·6	0·6	0·2	5·0	..	9·1	100	6·1	7·0	286	150
Molasses	24·0	2·2	..	63·8	..	10·0	1·0	..	..	57·3	..	..	88	50·3	59·8	∞	18
Treacle cubes ..	9·9	27·1	4·0	38·7	15·3	5·0	23·0	21·8	3·6	25·4	4·0	1·7	85	49·8	95·6	8	18
Linseed nuts	10·2	27·7	6·2	37·9	11·5	6·5	23·8	22·6	5·7	30·1	5·5	2·2	95	66·8	108·8	7	13

REMARKS: Foods marked † contain Hydrocyanic acid.

CHART OF DIGESTIBLE NUTRIENTS IN STOCK FOODS

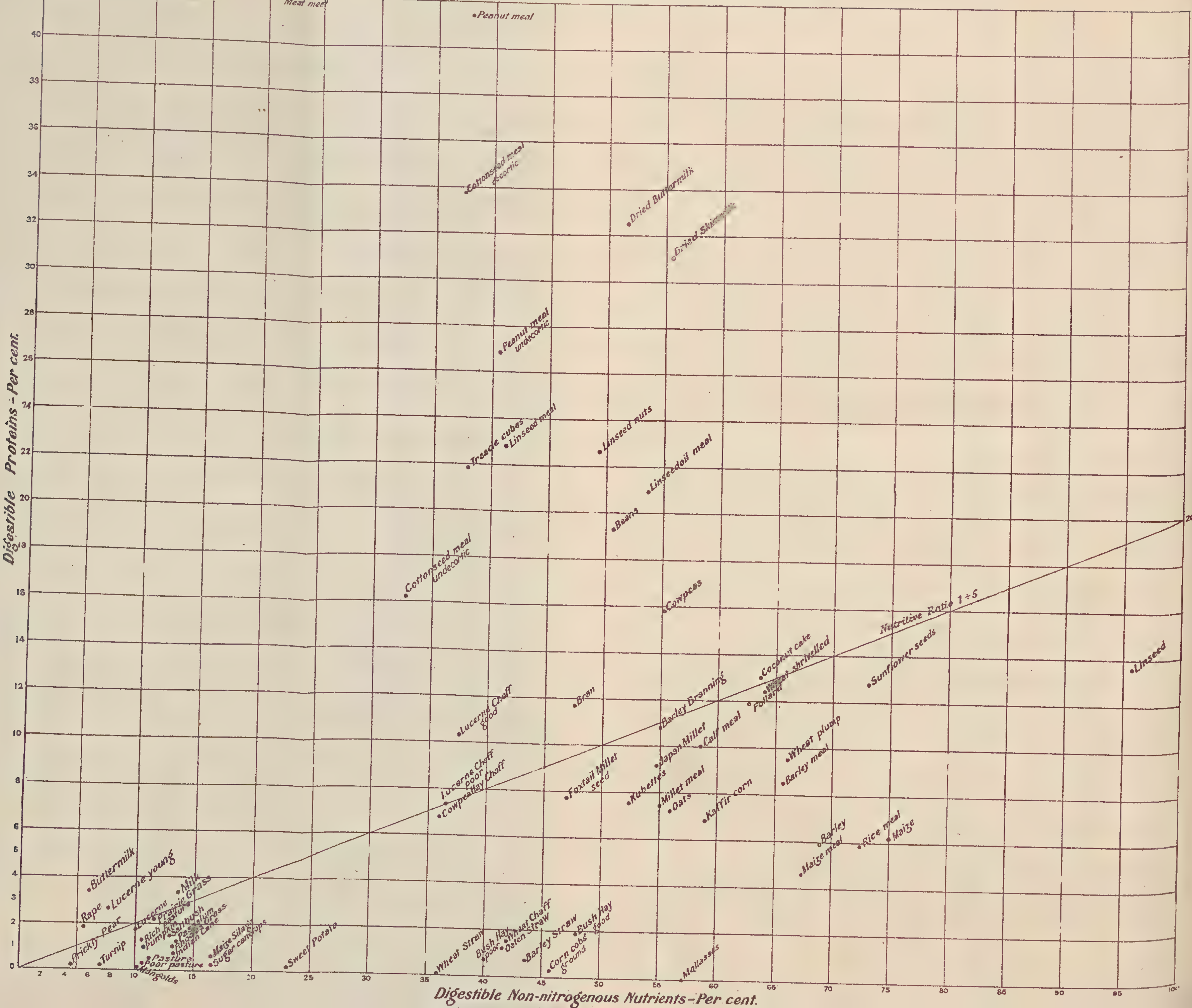


TABLE II.

Percentage of Nutrients Digested in Stock Foods.

	Crude Protein.	Crude Fat.	Carbo-hydrates.	Crude Fibre.
BY RUMINANTS—				
Pasture grass	56	46	61	62
Bush hay	35-61	49	49-65	46-64
Lucerne, green	77-83	37-54	65-77	32-47
Lucerne chaff	66-73	30-51	61-71	34-65
Green maize	56-78	40-83	66-78	59-75
Green sorghum	62	85	78	60
Wheat straw	0-26	17-44	29-40	42-59
Bran	80	51-60	40-88	37
Maize	58-84	81-99	84-100	46-100
Potatoes	23-88	..	82-99	..
Mangolds	44-89	..	91-100	0-43
Linseed cake	80-90	86-97	60-96	0-92
Cotton-seed meal, decorticated ..	84-96	93-100	44-71	0-100
Coconut cake	75-84	96-100	80-86	54-73
BY HORSES—				
Bush hay	43-62	6-33	45-61	34-39
Lucerne hay	70-77	6-30	67-71	35-44
Wheat straw	12-44	..	4-56	3-14
Potatoes	88	..	99	9
Carrots	99	..	94	..
Oats	68-94	50-88	70-84	1-56
Maize	75-78	59-63	90-94	40-100
Linseed cake	57-88	53	94-98	..
BY PIGS—				
Potatoes	57-88	..	97-99	28-88
Maize Meal	84	74	94	41
Wheat	80	70	83	60
Bran	75	70	65	30
Mangolds	55	..	98	79
Linseed cake meal	86	80	85	12
Coconut cake	73	83	89	60
Meat meal	97	86	..	..
Sour milk	96	95	98	..

TABLE III.

Standard Rations.

Per Day and per 1,000 lb. Live Weight of each Animal.	Dry Material in Total Ration.	Digestible Nutrients.	
		Pure Protein.	Starch Equivalent.
	Lb.	Lb.	Lb.
Horses—			
At light work	18 to 23	1·0	9·2
Medium work	21 to 26	1·4	11·6
Heavy work	23 to 28	2·0	15·0
Milch Cattle—			
For maintenance at rest	20	0·7	6·0
Yielding 10 lb. milk	22 to 27	1·0 to 1·3	7·8 to 8·[illegible]
Yielding 20 lb. milk	25 to 29	1·6 to 1·9	9·2 to 11·2
Yielding 30 lb. milk	27 to 33	2·2 to 2·5	11·8 to 13·9
Yielding 40 lb. milk	27 to 34	2·8 to 3·2	13·9 to 16·6
Fattening cattle	24 to 32	1·5 to 1·7	12·5 to 14·5
Growing Cattle—			
2-3 months, 150 lb. weight	23	3·4	18·5
3-6 months, 300 lb. weight	24	2·8	14·7
6-12 months, 500 lb. weight	26	2·3	12·5
12-18 months, 700 lb. weight	26	1·8	10·5
Sheep maintenance diet	18 to 23	1·2	8·7
Sheep fattening diet	24 to 32	1·9	14·5
Lambs, Wool Breeds—			
5-6 months, 60 lb.	27	3·0	16·4
6-8 months, 75 lb.	25	2·5	13·0
8-11 months, 80 lb.	23	1·8	10·7
11-15 months, 90 lb.	22	1·5	10·2
15-20 months, 100 lb.	22	1·2	9·7
Growing Pigs, Fattening Diet—			
2-3 months, 44 lb.	44	6·2	33·8
3-5 months, 110 lb.	36	4·5	32·0
5-6 months, 145 lb.	32	3·5	26·5
6-9 months, 200 lb.	28	3·0	24·5
9-12 months, 285 lb.	25	2·4	19·8

Table I. gives the actual composition of stock foods as obtainable and used. In recent publications the composition of foods, chiefly grasses, is generally given as calculated as percentage of water-free dry material, which allows a quicker comparison of the various materials. It must be understood that the composition must then be reduced by the amount of water present in the material, and, for instance, a young grass, reported to contain say 20 per cent. of protein in the dry matter, would only contain 5 per cent. of protein in the green stage with 75 per cent. of moisture, and 18 per cent. as hay with only 10 per cent. of moisture.

THE SEPTIC TANK.

Although civilisation, as we know it to-day, has conferred many benefits on mankind, it has also supplied us with quite a few problems and difficulties. One of the ever present problems is the proper and efficient disposal and destruction of human waste products. Particularly is this difficulty apparent in climates such as ours, where any carelessness and uncleanliness is liable to cause serious inconvenience and discomfort, and in many cases under certain conditions will cause the spreading of disease.

We know now that the common house-fly, generally supposed to be so harmless, is not only the filthiest of insects, but is also the most industrious germ-carrier ever found by science. We know that the fly breeds in any kind of filth, and it appears to have a particular preference for moist or wet nightsoil. Unfortunately, a plentiful supply of this is generally stored up by every household at a very convenient distance so that the fly may have full benefit of what we fondly believe to be for our special convenience.

The most general disposal of human wastes is by means of the "pan system." This system, if carefully carried out according to the Health Department's regulations, is reasonably safe, but breaches of these regulations are much too frequent by the people for whose protection they have been made, and nothing but an absolutely fool-proof method of disposal of these wastes can ever hope to be wholly satisfactory.

It has been found that the most satisfactory method of dealing with these wastes is by means of water. The water is made to act first as a collector, then as a carrier, and finally as a medium for final treatment and disposal.

The sewerage schemes of larger cities are sometimes difficult undertakings, often very expensive, but, because of the concentration of population, essential. But every home where a water supply is available, and where there is a sufficient supply to spare—say 3 to 5 gallons per head per day—can be provided with an inexpensive and efficient means for the disposal of these wastes.

The so-called septic or bacteriolytic tank is a self-contained sewerage system which, with but a modicum of care, will provide a home with a safeguard of health worth many times its price in convenience and comfort.

It requires no attention or cleaning out, and the only rule to observe is to see that no disinfectants are admitted to the tank. It saves the cost of a separate building, and, while the pedestal can be placed in a bathroom, the tank itself can be sunk in the ground under the house or be placed at any convenient point near it.

The Action of the Tank.

When the sewerage is discharged into the tank a separation immediately takes place, and floating matter rises to the top and particles in suspension gradually settle to the bottom.

Bacteriological action rapidly causes disintegration of the solids, which gradually become liquified. Evolution of gas takes place, and after some three to four weeks the top of the water in the tank becomes coated with a brown scum. The formation of this scum indicates a proper working condition of the tank, and it also forms an effective seal from the open air, and it is important that this scum be not broken.

If the depth of the tank is sufficient it will be found that there is a clear layer of water in the middle, and it is from this clear layer that the excess is drawn off.

As additional sewerage is added to the tank the clear liquid is expelled, and this liquid is then disposed of by means of a seepage-trench so constructed that both the evaporation and seepage are encouraged.

This effluent may be taken for some distance and used for irrigating trees or shrubs. It is not advisable to permit bath or kitchen water to enter the tank.

Septic tanks have been in use in Australia since about 1870. Many tanks have been in constant use for twenty years or more, and in view of the satisfactory experiences of users and the high degree of efficiency to which the designs of tanks now on the market have been brought there is no excuse save, perhaps, lack of the necessary water supply for the absence of proper and up-to-date methods of sanitation in most of the country homes in Australia. That any hotel providing accommodation for guests should be without proper convenience, so easily installed, is nothing short of a disgrace.

SHELTER FOR STOCK—ANOTHER ARGUMENT FOR TREES ON THE FARM.

Trees provide a very necessary shelter for stock of all descriptions. To see a mob of cows or sheep huddled beneath a tree during the bitter winds of winter is to realise that the health and well-being of stock demand the provision of some efficient shelter. Too much food material is wasted in "warming the wind," or in meeting the increased demands of an exposed body. Sheltered animals require less food. Stockowners agree that mortality among sheep, particularly during lambing and shearing seasons, would be considerably lessened if good shelter were available. Animals clearly demonstrate their need for shelter, and if the stock-owner were to provide it he would add appreciably to his profit.

Unlike breaks for crops or orchards, considerable latitude usually exists in the choice of a site for a stock shelter belt, as it may be situated practically anywhere within the paddock. Planting along the fence lines is often the method adopted, as the existing fence already provides protection on one side from damage by stock, necessitating the erection of only one new fence. In large paddocks, however, the shelter belt is best situated somewhere out in the centre of the paddocks, as stock have access to all sides of the belt, and can thus secure protection from all winds. On large areas such belts can be planted along ridges or on the top of small hills, and sites can be chosen which are not producing the best pasture grasses, but which are suitable for tree growth.

The shelter belt may be straight, crescent-shaped, or two belts may be arranged in the form of a cross. The last-mentioned shape is particularly effective, as it gives shelter over a fairly large area and from every quarter.

A bulletin "Tree Planting on the Farm," published recently by the New South Wales Department of Agriculture, from which the foregoing paragraphs are taken, contains a quantity of practical information on the various aspects of this subject.

BREEDING AND SELECTION OF DAIRY STOCK.

By C. F. McGRATH, Supervisor of Dairying.

THE industry needs better cows, and the dairy farmers and breeders must breed and rear the better cows, because they do not now exist to the extent required.

The foundation of the dairying industry for the future must be laid now in the breeding and rearing of high-class dairy stock.

That this work can be done with the degree of success its importance demands is evidenced by the success attained by many breeders of high-class dairy stock in this and other States of the Commonwealth.

Breeds of dairy cattle have been in existence for many years past, but the stud master of to-day breeds on dairy lines by selecting and mating animals whose parentage have high production records.

Pedigrees alone do not indicate the quality of milk and butter fat that a cow will produce. Such characteristics are the animal's heritage, and by careful dairying Nature's gift to her can be developed to its full capacity.

A successful stud master knows that a certificate of registry in a herd book is not evidence of high dairy production, and he realises that selection is not confined to pedigree. Attention is given to the constitution, production, conformation, and general characteristics of the animals selected from which to breed.

It is important that the constitution be sound, and this is indicated by large, well-developed lungs and a broad and deep chest. A sound state of digestive organs is important and has a great influence on all the functions of the body, and more especially on the secretion of milk.

Dairy type and conformation are readily discernible by the trained eye of the stock breeder. An animal of the desired type and character attracts and fills his eye and is then subjected to a close examination for the points and characteristics essential in good dairy animals.

A knowledge of the development of dairy qualities in cattle is a valuable aid in the selection and breeding of dairy stock.

The development of dairy qualities in the female begins by exciting the udder to unnatural activity by stripping it at frequent and regular intervals of all the milk secreted.

Care in handling and proper feeding are essential to produce high-quality dairy animals, and if supplemented with a sound knowledge of selection and breeding the desired characteristics will be transmitted to the offspring.

Such prepotency is to be obtained by line dairy breeding rather than by simply breed breeding.

Breeding.

A great deal has been written on breeding, and many breeders have contributed to the literature on the subject and quote pedigrees, and discuss high-class animals that have been inbred. Such results invariably reflect the intelligence of an experienced stud master.

Disastrous results have invariably followed inbreeding of dairy stock when practised by the inexperienced stock breeder, as is evidenced by the numbers of nondescript animals to be seen in many districts.

There are several methods of breeding, as practised by stud masters—viz., inbreeding, line breeding within distinct families, line breeding with distant strains of the same blood, and outcrossing, which is the continued introduction of fresh blood.

Inbreeding is the practice of mating closely related animals such as sire to daughter, son to dam, brother to sister.

It is considered that an animal is inbred when its parents have 50 per cent. or more of common ancestry in the pedigree.

The purpose of inbreeding is to fix or intensify desirable characteristics or qualities in animals so that they will more consistently transmit such characters to their offspring.

Many high-class flocks of sheep, herds of cattle, and breeds of horses have been established by inbreeding.

Such successes have been achieved by stock breeders who possessed an intimate knowledge of the breeding and general characteristics of the animals mated, a natural aptitude for their work, and the gift of observing the good and bad points of the selected animals.

The problem confronting the stud breeders is to choose animals that possess outstanding desired characters and to eliminate from the breeding operations those animals which possess undesirable characters. Skilful selection of the animals to be mated is the all-important factor in purifying the hereditary make-up of the individual in a herd, and for intensifying type and breed characteristics that will ensure that the offspring will inherit the character of the parents, to a degree equal to or better than their parents.

Line Breeding.

Line breeding may be differentiated from inbreeding as defining it as the mating of two animals identical to the extent of 25 per cent. and less than 50 per cent. of their blood. Line breeding is a popular practice with breeders, as it is not accompanied with so great a risk of reproducing and fixing undesirable characters as is associated with inbreeding.

Line breeding within proved strains of blood is a safe method for breeders desirous of improving their herds. The system widens the opportunities of selecting animals with desired characteristics.

Out Crossing.

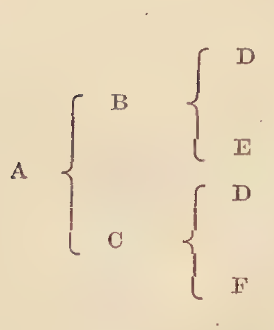
Outcrossing is the mixing of strains of blood within one breed by mating animals entirely unrelated or having less than 25 per cent. of common ancestry entailing a continuous change of blood.

This method of breeding is frequently disappointing unless controlled by an experienced breeder. Ability to select sires with the characteristics necessary to maintain or improve the standard of the herd to which he is mated is essential, otherwise the more fresh blood that is introduced the more uneven in character will the herd become, though a few high-class animals may be bred.

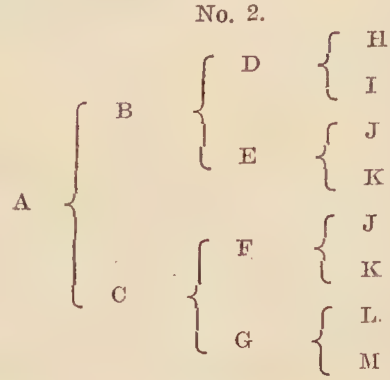
A study of Mendel's laws of heredity will enable the breeder to readily understand why the outcrossing method is often unsuccessful and misleading to the young and inexperienced breeder of live stock. The pedigrees tabulated herewith clearly indicate the difference in the methods of breeding.

INBREEDING.

No. 1.



No. 2.

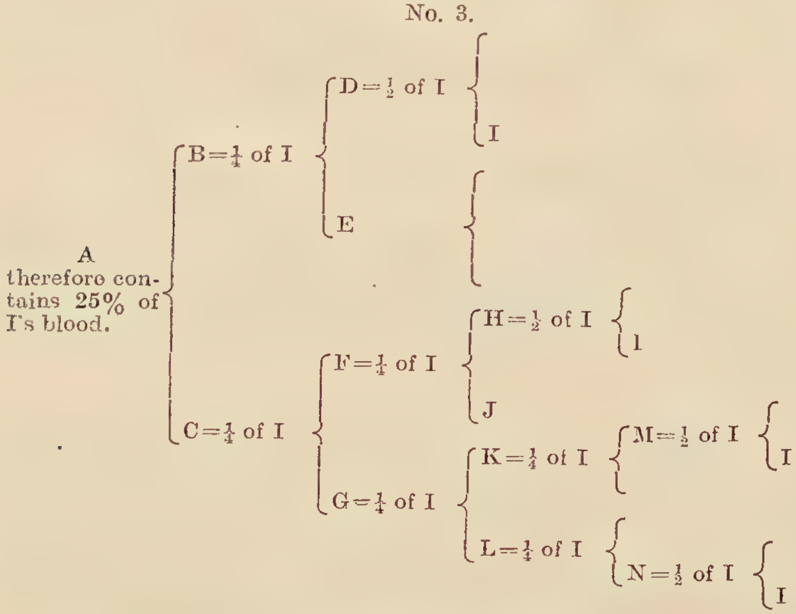


No. 1 tabulation indicates that A is inbred as son and daughter of sire D are mated.

No. 2 tabulated example indicates that E the dam of B (sire) and F the sire of C are full brother and sister, so that B and C the sire and dam of A are first cousins, in blood.

LINE BREEDING.

No. 3.



No. 3 tabulation indicates that A has been line bred to dam I. The dam G having two lines of blood to I has been mated with F, whose sire H is a son of I, and the progeny C has been bred to the sire B who is a grandson of I.

In this case line breeding with distant strains of the blood of dam I has been carried out, and there has been sufficient latitude to allow faults to be eliminated and desired characteristics to be fixed by selection.

By this method desired individual characteristics of animals can be retained or intensified in the progeny.

The breeder should make up his mind as to the breed he considers most suitable and which he desires to establish, and then select the foundation stock from breeders whose stock come nearest to his ideal.

A keen observation of the animals he is breeding will enable him to cull his herd and select sires to fix type and character which are essential to success. Sound judgment in selection and mating and judicious feeding are necessary in the successful establishment of a profitable dairy herd.

PRODUCTION RECORDING.

List of cows officially tested by officers of the Department of Agriculture and Stock and which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Ayrshire Herd Book of Queensland, and the Friesian Herd Book of Australia. The final tests of these cows were carried out during the months of March and April, 1931. (273 days period unless otherwise stated.)

Name of Cow.	Age.	Milk Production.	Butter Fat.	Sire.	Dam.	Owner.
		Lb.	Lb.			
			AUSTRALIAN ILLAWARRA SHORTHORN.			
Wunulla Carnation	Mature	11,980·612	525·056	Robin Hood of Greyleigh	Lucy of Wunulla	H. Welch, Proston
Vida 5th of Werona	Mature	9,768·692	360·577	Young Kitchener of Burradale	Vida 1st of Waughope	J. W. Johnston, Wooroolin
Sylvia of Royston	Mature	8,400·0	374·979	Artist of Wunulla	Favourite of Royston	T. G. O'Meara, Humphrey
Daisy Belle of Rockleigh	Mature	9,235·749	378·638	..	Queenie	T. Strain, *via* Wondai
Meg of Beechwood	Mature	8,669·25	396·545	Royal Prince of Blacklands	Maggie of Beechwood	F. W. Woolley, Moregatta
Fleecy of Beechwood	Mature	11,324·6	459·462	Royal Prince of Blacklands	Florrie of Beechwood	F. W. Woolley, Moregatta
Primrose of Dnalwon	Mature	13,029·475	412·331	Dairyman of Fairfield	Nightshade 2nd of Dnalwon	A. J. Caswell, Wangalpong
Midge 5th of Sunnyview	Mature	13,733·5	497·977	Diamond of Greyleigh	Midge 4th of Greyleigh	W. H. Thompson, Nanango
Princess 3rd of Oakvilla	Mature	9,858·287	397·87	British Admiral	Princess 2nd of Oakvilla	W. Marquardt, Wondai
Rosebud 3rd of Oakvilla	Mature	9,548·716	374·312	Gussie	Rosebud 2nd of Oakvilla	W. Marquardt, Wondai
Ruby 3rd of Lemon Grove	Mature	11,238·222	441·316	Dan of Greyleigh	Ruby of Lemon Grove	J. Phillips, Wondai
Myrtle 4th of Lemon Grove	Mature	15,676·647	620·062	Dan of Greyleigh	Myrtle 3rd of Lemon Grove	J. Phillips, Wondai
Silver 12th of Upton	Mature	10,717·625	388·43	Red Rose of Hillcrest	Silver 3rd of Upton	W. J. Barnes, Beaudesert
Venus 3rd of Euroa	Mature	8,807·5	358·022	Sperrys Boy of White Park	Venus of Hillcrest	H. F. Lindenmayer, Binjour
Lady 3rd of Pine View	Mature	10,001·0	357·36	Master Togo of Oakvale	Lady 2nd of Pine View	Hickey and Sons, Wilston
Pigeon of Wadevale	Mature	12,918·25	583·580	Brigadier of Burradale	Damsel of Wadevale	J. Wade, Kilcoy
Beauty 2nd of Greenhills	Mature	12,926·639	514·952	Diamond Boy of Blacklands	Beauty of Greenhill	J. W. Johnston, Wooroolin
Melba 4th of White Park (270 days)	Mature	9,448·75	352·803	Renown of White Park	Melba of White Park	W. T. Savage, Barnesmore
Beauty of Pinelands	Mature	9,650·25	454·597	Plums Boy of Mountside	Margaret of Durham Park	A. E. Vohland, Aubigny
Fancy 6th of Rosemount	Mature	9,962·45	386·634	Sunbeam of Yarallah	Fanny 2nd of Rosemount	A. J. Bryce, Maleny
Belle of Kingsdale	Mature	9,167·8	465·47	Nellies Jellicoe of Nestle Brae	Dainty Bell of Kingsdale	A. A. King, Mooloolah
Ruby of Corunna	Mature	10,776·039	399·337	Victor 2nd of Balmoral	Champion 2nd of Corunna	Mrs. J. Handley, Murphy's Creek
Primrose XI of Greyleigh	Mature	9,990·375	393·739	Foch of Greyleigh	Primrose 4th of Greyleigh	A. Kamholtz, Nerang
Damsel of Royston (272 days)	Mature	9,163·0	355·222	Sperry 2nd of White Park	Rita of Royston	T. G. O'Meara, Humphrey
Sylvia of Royston	Mature	8,400·0	374·979	Artist of Wunulla	Favourite of Royston	T. G. O'Meara, Humphrey
Fairy of Wadevale	Mature	8,159·0	354·273	Brigadier of Burradale	Ruby of Wadevale	J. Wade, Kilcoy
Charm 2nd of Bri Bri	Senior (4 years)	10,365·55	399·495	Gay Boy of Tyrone Villa	Charm of Hillview	A. E. Vohland, Aubigny
Champion 5th of Oakvilla	Senior (4 years)	10,156·537	434·236	Victorious of Oakvilla	Champion 2nd of Oakvale	W. Marquardt, Wondai
Iris of Wadevale	Senior (4 years)	8,113·8	371·053	Brigadier of Burradale	Alma of Wadevale	J. Wade, Kilcoy
Gentle 2nd of Lynfield	Senior (4 years)	5,346·6	234·901	Royal Monarch of Blacklands	Gentle of Lynfield	F. E. Birt, Sexton
Frizzy 4th of Rosenthal	Senior (4 years)	8,612·75	355·009	..	..	S. Mitchell, Warwick

PRODUCTION RECORDING—*continued.*

Name of Cow.	Age.	Milk Production.	Butter Fat.	Sire.	Dam.	Owner.
		Lb.	Lb.			
AUSTRALIAN ILLAWARRA SHORTHORN—*continued.*						
Fairy of Montcairn	Junior (4 years)	10,741·45	462·325	..	Foundation cow	A. E. Vohland, Aubigny
Fan 2nd of Beechwood (264 days)	Junior (4 years)	6,588·7	317·738	Royal Lad of Blacklands	Fanny of Corle Park	F. W. Woolley, Moregatta
Red Rose of Glengallon	Junior (4 years)	9,762·25	404·334	Jellicoe of Blacklands	Lassie 2nd of Glengallon	A. M. Bowman, Kin Kin
Donah of Springdale	Senior (3 years)	11,100·9	404·141	Lovely's Commodore of Burradale	Donah 2nd of Strathobi	V. Dunstan, Wolvi
Miss Flirt of Blacklands	Senior (3 years)	8,805·581	312·251	Sultan of Blacklands	Flirt of Blacklands	A. Pickels, Wondai
Irene of Wadevale	Senior (3 years)	6,451·9	292·647	Emblem of Oakvale	Rosebud of Wadevale	J. Wade, Kilcoy
Dot 5th of Oakvilla	Senior (3 years)	10,480·85	406·672	Victory of Greyleigh	Dot 2nd	W. Marquardt, Wondai
Moss 4th of White Park	Senior (3 years)	8,127·875	327·305	Violet's Emperor of Hillview	Moss of White Park	W. T. Savage, Barnesmore
Pendant 7th of White Park	Senior (3 years)	7,737·375	332·932	Violet's Emperor of Hillview	Pendant 2nd of White Park	W. T. Savage, Bainesmore
Olive 10th of Cedar Grove	Junior (3 years)	10,874·375	453·09	Dandy of Ocean View	Olive 3rd of Cedar Grove	C. O'Sullivan, Greenmount
Nancy 14th of Springdale	Junior (3 years)	10,945·694	495·771	..	..	J. Phillips, Wondai
Rose 2nd of Wilga Vale	Junior (3 years)	9,666·0	375·192	Brilliant of Wilga Vale	Rose of Wilga Vale	A. E. Vohland, Aubigny
Queenie 5th of Rhodesview	Junior (3 years)	6,522·625	232·548	Birdwood of Blacklands	Queenie of Rhodesview	W. Sierkie and Sons, Helidon
Melba of Sunnyview	Junior (3 years)	10,929·29	446·425	Diamond of Greyleigh	Chance 2nd of Woodleigh	J. Phillips, Wondai
Clyde 5th of Glenthorn	Junior (3 years)	9,461·05	347·206	Blue Boy of Glenthorn	Clyde 2nd of Glenthorn	T. Shuttlewood, Peachester
Lady of Hillvale	Senior (2 years)	9,858·0	410·504	Drafter of Greyleigh	Lady II. of Fairleigh	C. Schoenfisch, Coleyville
Queenie 12th of Brooklyn Terrace	Senior (2 years)	12,968·5	579·506	Gamble of Greyleigh	Queenie 8th of Brooklyn Terrace	C. Schoenfisch, Coleyville
Starlight 3rd of Beechwood	Senior (2 years)	6,203·85	267·375	Royal Lad of Blacklands	Starlight of Beechwood	F. W. Woolley, Moregatta
Bangle 2nd of Greenfields	Senior (2 years)	7,809·279	309·198	Radiant of Greyleigh	Bangle of Greenfields	H. Welch, Proston
Fanny 5th of Norwood	Senior (2 years)	7,723·25	289·782	President of Sunnyside	Fanny 3rd of Norwood	S. R. Alcock, Wooroolin
Nellie of Lynfield	Senior (2 years)	6,755·75	270·211	Royal Monarch of Blacklands	Edie 2nd of Lynfield	F. E. Birt, Sexton
Jenny 6th of Waughope	Senior (2 years)	6,908·15	291·977	Royal of Glenburn	Jennie 2nd of Waughope	A. M. Bowman, Kin Kin
Plume 2nd of Waughope	Senior (2 years)	6,009·25	272·493	Royal of Glenburn	Plume of Waughope	A. M. Bowman, Kin Kin
Favourite 2nd of Wunulla	Senior (2 years)	8,720·25	330·323	Little John of Greyleigh	Wunulla Favourite	W. J. Barnes, Cedar Grove
Honey 2nd of Oakvilla	Junior (2 years)	7,797·963	315·52	Victory of Greyleigh	Honey	W. Marquardt, *via* Wondai
Naomi of Springdale	Junior (2 years)	8,928·3	361·512	Volunteer of Hillview	Naomi 2nd of Nestle Brae	V. Dunstan, Wolvi
Princess 2nd of Homelea	Junior (2 years)	6,880·25	263·589	..	..	J. Savage, Humphrey
Daisy XI. of Springdale	Junior (2 years)	11,194·766	461·955	..	..	J. Phillips, Wondai
Velvet of Doctors Creek (268 days)	Junior (2 years)	5,762·55	237·817	Gentle Boy of Burradale	Betty of Springvale	A. E. Vohland, Aubigny
Starlight 2nd of Oakvilla	Junior (2 years)	8,973·597	385·271	Victory of Greyleigh	Starlight	W. Marquardt, Wondai
Princess 6th of Oakvilla	Junior (2 years)	8,982·235	365·514	Victory of Greyleigh	Princess 3rd of Oakvilla	W. Marquardt, Wondai
Plover 4th of Rhodesview	Junior (2 years)	6,726·03	250·715	Birdwood of Blacklands	Plover 2nd of Rhodesview	W. Gierkie and Sons, Helidon
Pretty Girl of Blacklands (365 days)	Junior (2 years)	9,860·4	417·983	Fussy's Monarch of Hillview	Pretty Maid of Blacklands	A. Pickels, Wondai
College Rascal	Junior (2 years)	7,533·404	302·345	Fussy's Kitchener of Hillview	Rascal 7th of Thornleigh	Queensland Agricultural High School and College, Gatton
Vesta 2nd of Hillvale (150 days)	Junior (2 years)	5,829·0	270·614	..	..	C. Schoenfisch, Coleyville
Daphne of Valencia	Junior (2 years)	7,079·5	295·256	..	..	W. Turner, Riverleigh
Dulcie of Lynfield (365 days)	Junior (2 years)	7,522·75	323·22	..	..	F. E. Birt, Sexton

PRODUCTION RECORDING—*continued*.

Name of Cow.	Age.	Milk Production.	Butter Fat.	Sire.	Dam.	Owner.
		Lb.	Lb.			
				JERSEYS.		
Trinity Gem	Mature	8,827·0	450·79	Lord Ettrey of Banyule	Trinity Blue Bell.	J. Sinnamon, Moggill
Trinity Jewel	Mature	10,095·0	487·847	Ginger Duke	Brunette	J. Sinnamon, Moggill
Trinity Velveteen 2nd	Mature	7,127·0	441·894	Ginger Duke	Trinity Velveteen	A. H. Dahl, Taragoola
Carlyle Pamela	Mature	7,847·35	382·044	Carlyle Larkspur King	Carlyle Melba	J. Williams, Wondai
Glenview Lady Scot	Mature	7,262·9	357·674	Noble Scot	Glenview Handsome	F. P. Fowler and Sons, Coalstoun Lakes
Christmas Lily of Morago	Mature	9,014·0	412·496	Oxford Valentine	Vixen	J. W. Evans, Boonah
Prospect Charm 6th	Mature	7,177·313	365·05	Kyora Retford Mike	Prospect Charm 3rd	T. A. Petherick, Lockyer
Oaklands Mischief	Mature	7,312·5	352·269	Ruler of Hillcrest	Oaklands Eva 10th	E. J. Melville, Toogoolawah
Yimmin Starbright	Mature	6,100·45	399·624	Starbright King of Pella	Yimmin Primrose 2nd	Burton and Co., Yandina
Dulcie of Southport	Senior (4 years)	6,294·95	328·797	Trinity Alfriston Duke	Debut of Southport	E. G. Groves, Gympie
Beauty of Southport	Senior (4 years)	7,366·55	407·54	Budget	Beauty 3rd	E. G. Grooves, Gympie
Vida of Bellevue	Junior (4 years)	7,333·5	354·300	Goldfinder	Miss Verbenia of Bellevue	J. W. Evans, Boonah
Oxford Daffodil	Junior (4 years)	8,244·75	499·724	Oxford Brighton King	Oxford Palatine's Dinah	E. Burton and Sons, Wanoon
Ruby of Bellevue	Junior (4 years)	6,917·5	355·321	Goldfinder	Gem of Belle Vue	J. W. Evans, Boonah
Hope On of Woodstock	Senior (3 years)	6,117·875	304·207	Manager of Woodstock	Master's Hope 2nd of Woodstock	P. C. Henman and Sons, Mudgeeraba
Sunnyside Clementine	Senior (3 years)	6,394·65	293·492	Oxford King's Own	Sunnyside Sylvia	Matthew Bros., Pinelands, Crow's Nest
Glengarry Progressa IV.	Senior (3 years)	6,535·1	319·949	Glengarry Benedictine's Heir	Progressa 3rd	J. and R. Williams, Glencliff
Yimmin Wildflower	Senior (3 years)	5,726·1	327·526	Yimmin Starbright King	Yimmin May Flower 2nd	Burton and Co., Yandina
Ginger Meg	Junior (3 years)	7,458·0	373·7	Maggie 2nd's Hero of Wattle Grove	Melrose Countess	D. R. Hutton, Cunningham
Trinity Shamrock	Junior (3 years)	5,333·15	319·417	Ginger Duke	Dunmore Oxford Crocus	S. J. O'Keefe, Nambour
Trinity Wattle	Senior (2 years)	6,569·5	377·974	Trinity Governor	Trinity Acacia	J. Sinnamon, Moggill
Majesty's Lillian of Brooklands	Senior (2 years)	5,129·5	261·26	His Majesty of Dalebank	Linda's Fern of Brooklands	W. S. Conochie, Sherwood
Girlie of Hillview	Senior (2 years)	5,578·8	266·077	Jolly Fox of Rosedale	Bounce 2nd of Hillview	A. W. Doel, Gunalda
Silver Beauty of Southport	Senior (2 years)	6,123·767	311·146	Werribee Twylish Starbright King	Beauty of Southport	J. F. Jenkinson, Goomeri
Joyce of Oakview	Senior (2 years)	5,026·6	271·24	Oakview Merry Pat	Jolly Flossie 2nd of Oakview	A. F. Birt, Gundiah
Trinity Mayoress	Senior (2 years)	4,940·9	261·572	Ginger Duke	Trinity Sultane's Lass	E. J. O'Keeffe, Nambour
Trinity Gerbera	Senior (2 years)	4,824·2	240·004	Ginger Duke	Trinity Wallflower	E. J. O'Keeffe, Nambour
Gleam of Ipsley	Senior (2 years)	5,806·5	357·96	Trinity Ginger Fox	Mist of Ipsley	J. A. Rudd, Corinda
Irene of Rosehill	Senior (2 years)	5,916·6	288·257	Raleighs Lad of Rosehill	Darcen of Rosehill	E. G. Groves, Gympie
Cassie of Calton	Junior (2 years)	7,438·317	335·383	Emperor of Calton	Dianthus of Calton	J. Collins, Tingoora
Trinity Candytuft	Junior (2 years)	7,008·0	377·0	Lord Ettrey of Banyule	Trinity Blue Bell	J. Sinnamon, Moggill
Prides Crystal of Burnleigh	Junior (2 years)	6,485·1	337·798	Trinity Darby	Sultane's Pride of Burnleigh	W. W. Mallett, Nambour
Westwood Buttercup	Junior (2 years)	4,369·0	235·576	Empire of Woodside	Myoora Blossom	H. Mear, Maleny
Majesty's Tibby of Brooklands	Junior (2 years)	6,361·0	304·672	His Majesty of Dalebank	Kinnahaird Tibby	W. S. Conachie, Sherwood
Oxford Aster	Junior (2 years)	5,826·625	324·3	Trinity Ambassador	Oxford Rosina	E. Burton and Sons, Wanora

PRODUCTION RECORDING—*continued.*

Name of Cow.	Age.	Milk Production.	Butter Fat.	Sire.	Dam.	Owner.
		Lb.	Lb.			
JERSEYS—*continued.*						
Westwood Fancy	Junior (2 years)	5,251·25	293·234	Empire of Woodside	Flo of Southport	H. Mear, Maleny
Glenview Lady Lyn of Woodbine	Junior (2 years)	5,607·0	260·063	Retford Thorns Viscount	Carlyle Lady Lynn	F. P. Fowler and Sons, Coalstoun Lakes
Flower Girl of Rosehill (270 days)	Junior (2 years)	4,739·1	275·105	Retford Raleigh's Chief	Trinity Bride	T. Gillespie, Ravenshoe
Oxford Snowflake	Junior (2 years)	5,782·5	300·288	Trinity Ambassador	Oxford Daphne	E. Burton and Sons, Wanora
Pineview Jewel	Junior (2 years)	5,670·375	320·847	Oxford Buttercup's Noble	Pineview Princess	J. Hunter and Sons, Borallon
Queenie of Chelsford	Junior (2 years)	5,039·5	265·768	Zenobia's Mascot of Woodstock	Sweet Clare of Chelsford	G. A. Ferguson, Woodhill
AYRSHIRES.						
Longlands Bella 3rd	Mature	10,053·958	395·71	Fairview Prince Roy	Longlands Bella	T. Holmes, Yarranlea
Longlands Isabel II.	Mature	8,721·375	357·090	Fairview Prince Roy	Longlands Isabelle	T. Holmes, Yarranlea
Jeanette of Benbecula	Mature	9,512·048	356·474	Longlands Sir Gallant	Benbecula Jean	T. Holmes, Yarranlea
Longlands Tina 5th (365 days)	Mature	13,123·625	482·791	Gallant Hero of Longlands	Longlands Iris 4th	T. Holmes, Yarranlea
Benbecula Jilt	Senior (4 years)	9,114·95	346·572	Benbecula Dairy Boy	Benbecula Jill	T. Holmes, Yarranlea
Benbecula Boronia	Senior (4 years)	10,628·058	389·194	Benbecula Dairy Boy	Benbecula Bonnie	T. Holmes, Yarranlea
Longlands Marguerite	Junior (3 years)	9,082·388	347·91	Jellicoe of Marinya	Benbecula Margaret	T. Holmes, Yarranlea
Benbecula Jaunty	Senior (2 years)	9,080·960	328·319	Nero of Bellvue	Benbecula Jill	T. Holmes, Yarranlea
Benbecula Maureen	Junior (2 years)	6,844·65	237·414	Benbecula Nero	Longlands Marguerite	T. Holmes, Yarranlea
Benbecula Janet (259 days)	Junior (2 years)	9,013·483	353·288	Bellvue Nero	Benbecula Jessie	T. Holmes, Yarranlea
FRIESIAN.						
College Princess Pontiac	Mature	19,322·0	643·564	Pabst Pontiac Blue Star	College Prima Donna	Hickey and Son, Wilston
Dairymaid 3rd of Oaklands	Senior (4 years)	10,779·658	417·865	Prince Colantha 2nd of Ryfield	Oaklands Dairymaid	W. Richters, Tingoora
St. Athan Bee	Senior (3 years)	14,143·429	442·432	Pied Rock	St. Athan Belle 3rd	G. Newman, Wyreema
Oaklands Holly 4th	Junior (2 years)	8,018·604	312·657	Oaklands Prince Colantha	Hollyhock 2nd of St. Athan	W. Richters, Tingoora

General Notes.

Butter Board.

The Deputy-Governor, acting for and on behalf of His Excellency the Governor, in Council, has approved of the issue of an Order in Council extending the operations of the Butter Board for a further period of three years, from 1st July, 1931, to 30th June, 1934.

Levy for Banana Board.

The Governor in Council has approved of the issue of an Order in Council renewing for a further twelve months the levy for the maintenance of the Banana Industry Protection Board.

Assessment at the rate of 1½d. per case containing 1⅓ bushels or less for all bananas marketed in the case, and 2d. in the £1 or part thereof on the proceeds of sales of all bananas marketed in the bunch, was levied during last year, and this will again be enforced this year.

Wheat Board Election.

The election to fill the vacancy for District No. 4 on the State Wheat Board, caused by the lamented death of the late Mr. J. T. Tod, resulted as follows:—

John Edward Nussey (Allora)	383
John Edwin Maher (Allora)	119

Mr. Nussey will therefore be appointed to hold office for the term ending 31st August, 1932.

Queensland Canegrowers' Council.

His Excellency the Governor in Council has approved of the issue of an Order in Council under "*The Primary Producers' Organisation and Marketing Acts, 1926 to 1930*," amending a previous Order in Council which enumerates the powers of the Queensland Canegrowers' Council. The new Order adds a further provision to the effect that the powers and duties of the Queensland Canegrowers' Council (which are undertaken in co-operation with the Department of Agriculture, District Canegrowers' Executives, Mill Suppliers' Committees, and others) shall include that legal advice and assistance for growers or others upon any matters of importance to the sugar industry and sugar-cane growers, shall be provided.

Regulations have also been approved under the abovementioned Acts, and these embody the Rules and Regulations of the Queensland Canegrowers' Council, District Canegrowers' Executives, Mill Suppliers' Committees, and also describe the conduct of the business of the Annual Conference of the Sugar Industry or any special conference. They deal with the procedure at meetings of the Council and its various units, and state the objects, powers, and functions of the District Canegrowers' Executives and Mill Suppliers' Committees.

Banana Leaf Spot.

The Minister for Agriculture and Stock (Mr. H. F. Walker) recently made reference to the fact that the plant pathological staff of the Department had for some time been devoting considerable attention to the investigation of banana leaf spot. A progress report has now been completed and will appear in an early issue of the "Queensland Agricultural Journal." Attention has also been more recently directed to the question of the effect of arsenical spraying for weed control on the prevalence of leaf spot in banana plantations. This aspect of the problem was discussed at the last meeting of the Banana Industry Protection Board, and the effect of arsenical sprays on the development of the spores of the fungus responsible for banana leaf spot is now under investigation in the departmental laboratories. The chief point under consideration is the extent, if any, to which arsenicals sprayed on weeds and trash on the ground will reduce infection of the living plant tissue. Obviously, if such arsenical sprays as are suitable for weed control prove on investigation to be capable of reducing the numbers of banana leaf spot spores in the plantations to an extent sufficient to reduce infection, the sprays can be applied only to the weeds and dead trash on the ground. Any application of the sprays to the living plant would be disastrous.

Staff Changes and Appointments.

The following have been appointed members of the Southern District Stallion Board:—J. A. Rudd, L.V.Sc., Melb. (Chairman), S. H. Harding, P. Short, and J. Sprott.

Mr. James Anderson, of Caloundra, has been appointed an honorary ranger under the Animals and Birds Acts.

Constable James McAfee, Stonehenge, via Longreach, and Constable A. V. Tanner, Mount Molloy, have been appointed also inspectors under the Slaughtering Act.

Mr. H. C. Quodling, Director of Agriculture, Department of Agriculture and Stock, has been appointed manager of the Agricultural Bank, Brisbane.

Constable E. A. Bauer has been appointed also an inspector under the Slaughtering Act at Ewan.

Messrs. C. T. White (Government Botanist) and W. D. Francis (Assistant Government Botanist) have been appointed also honorary rangers under "*The Native Plants Protection Act of* 1930."

Messrs. H. J. Freeman (Senior Instructor in Fruit Culture, Cairns), H. St. J. Pratt (Instructor in Fruit Culture, Stanthorpe), and W. D. Wilson (Ranger, Animals and Birds Acts, Brisbane) have been appointed collectors of royalty under the Animals and Birds Acts for the present opossum season.

Mr. Arthur Patrick Donnelly has been appointed canegrowers' representative on the Farleigh Local Sugar-cane Prices Board, vice Mr. Philip Kirwan, resigned.

The resignation of Mr. C. H. Jorgensen as cane tester at Millaquin Mill has been accepted. Mr. T. D. Cullen, cane tester, has been transferred from North Eton Mill to Millaquin Mill, and Miss Olive Knight has been appointed cane tester at North Eton Mill.

Miss Veronica Page, assistant cane tester, Moreton Mill, has been transferred to Racecourse Mill as from 29th July, 1931, and the following have been appointed assistant cane testers at the mills as under:—Miss Margaret Thorburn, South Johnstone Mill (23rd July, 1931); Mr. R. D. Woolcock, Qunaba Mill (7th August, 1931); Miss Doris Aldridge, Moreton Mill (28th August, 1931).

Mr. R. A. Tarrant, instructor in agriculture, has been transferred from Atherton to Brisbane.

Mr. A. Hamilton, instructor in agriculture, at present attached to Townsville, will be attached to Mareeba.

Mr. William H. Braun has been reappointed an acting inspector of stock at Dallarnil, as from 1st August, 1931.

Mr. Arthur Smith, the Manager of Cooroorah Station, via Blackwater, in the Emerald district, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. O. J. Wallin, of Deception Bay, has also been appointed an Honorary Ranger under the abovementioned Acts.

The Officer in Charge of Police at Esk has been appointed an Acting Inspector of Stock.

Mr. K. King, Agent under the Banana Industry Protection Act, will be transferred from Rockhampton to Maryborough, as from the 1st August, 1931.

The Governor in Council has approved that all rangers under the Animals and Birds Acts, inspectors of stock, slaughter-houses, dairies, and plants, be appointed also honorary rangers under and for the purposes of "*The Native Plants Protection Act of* 1930," as from the 25th July, 1931.

Acquisition of Tomatoes by C.O.D.

The Governor in Council has approved of the issue of a Regulation under the Fruit Marketing Organisation Acts, which provides for a ballot to be taken on the question of the acquisition of tomatoes by the Committee of Direction of Fruit Marketing. The ballot will be conducted by the Committee of Direction, and will close at noon on the 31st August, 1931. Growers concerned for the purposes of the poll will comprise all persons, not being persons engaged in the growing of tomatoes as employees on wages or piecework rates, who have, and who sign a declaration that they have, at the date of the poll, tomatoes growing in certain specified areas for market.

License to Manufacture Arrowroot Flour.

Regulations under the Primary Producers' Organisation and Marketing Acts have been approved which provide that no person shall manufacture arrowroot flour unless he holds a license to do so issued by the Arrowroot Board with the approval of the Minister. A license may be issued for such period as the Board shall determine, but the period shall not extend beyond the term of the Order in Council which provided that arrowroot flour should be placed under the control of the Board. Application for a license must be made to the Board before manufacturing commences, and such licenses may be cancelled at any time. No fee is necessary for a license, and no license is transferable.

C.O.D.—Sectional Group Elections.

On the 27th June, 1930, Regulations 74, 75, and 77 under the Fruit Marketing Organisation Acts, setting out the electorates for the annual elections of the pineapple, citrus, and other fruits sectional group committees, were approved. For the elections this year, in the cases of the abovementioned sectional group committees, the desired electorates are slightly different. The electorates recognised in 1929 and 1930 for the banana and deciduous sectional group committees also differ slightly this year, and accordingly, regulations have been issued rescinding Regulations 73 and 76 dated 8th August, 1929, and 74, 75, and 77 made last year, and substituting new ones therefor. These new regulations set out the electorates which will be recognised for the forthcoming elections of the banana, pineapple, citrus, deciduous, and other fruits sectional group committees.

The Royal Society of Queensland.

At the July meeting of the Royal Society of Queensland, the President, Dr. D. A. Herbert, occupied the chair, and about thirty members and visitors were present. Messrs. B. Blumberg, D. Fison, and Cummings were unanimously elected ordinary members of the Society. Mr. R. Wilson was proposed for ordinary membership by Messrs. Bick and Perkins.

Mr. G. H. Hardy read a paper entitled "Aphididae in Australia."

This paper gives an account of the Aphides found to occur in Australia, only one being regarded as definitely indigenous. Twenty genera are recorded, those of the subtribe Pentalonina being treated in full. A list of identified aphides and their host-plants is given, and also a list of indigenous plants found harbouring aphides in Queensland.

Mr. C. T. White exhibited specimens of three species of *Aceratium* all from North-eastern Queensland. The genus was previously only known to consist of twelve species, ten in New Guinea, one in the Molucca Islands, and another in the New Hebrides. The genus belongs to the family Elaeocarpaceae and has not previously been recorded for Australia. Descriptions of the Australian species have been drawn up and will be published at an early date.

Dr. Bagster performed a very interesting experiment, using ether to demonstrate critical phenomena in a liquid-gas system.

Mr. H. J. Hines demonstrated (*a*) a new colormetric method for the determination of P_2O_5 and As_2O_5 (Zinzadze. Z. Pflanz. Düng., 1930, 16A, 129); (*b*) an electrical method for the reduction of draft in ploughing (Crowther and Haines J. Agric. Sci., 1924, 221); (*c*) the Zeiss Cardiod Condenser.

Dr. Herbert exhibited (*a*) *Nostochopsis lobatus* Wood, a blue green Alga from the Albert River; (*b*) *Rafflesia manillana* flowers collected at 2,000 feet altitude on Mount Maquiling, Philippine Islands; this plant is parasitic on *Cissus* sp. and the flowers only are external, the vegetative parts being reduced to strands in the host tissues; (*c*) on behalf of Mr. L. F. Hitchcock a specimen of the bark of *Sterculia* sp., from the West Indies, prepared to show the reticulated rings of bast fibres.

Mr. Perkins exhibited (*a*) a female gall of *Apiomorpha excupula* Full. (Fam. Coccidae) on *E. paniculata* collected at Bauple, Q., by Mr. F. Sheldon Stringer; this is a new record for the State and also a new host record; (*b*) specimens of the Buffalo Fly (*Lyperosia exigua*) collected on Mornington Island by Dr. I. A. Mackerras.

Mr. McCall exhibited an Analytic Quartz Lamp. This is a mercury vapour lamp so fitted with two Wood's filters that ultra violet rays are projected horizontally and vertically. The vertical rays fall inside movable black curtains, so that specimens may be examined for fluorescence in daylight. The effect of the ultra violet rays was shown on various drugs and chemicals, also on minerals and precious stones.

Control of Brumbies.

The Diseases in Stock Act Amendment Act which was passed last session of Parliament provides, amongst other things, for the destruction of brumbies on stock holdings in Queensland under certain conditions. The provisions, however, apply only to such portions of the State as are proclaimed by the Governor in Council, and are limited to a period of not more than four months in any year.

The Governor in Council has approved of a Proclamation declaring the Cloncurry stock district to be a district in which the provisions relating to the destruction of brumbies shall apply, but such provision shall apply in this district only for four months—from 1st August, 1931, to 30th November, 1931.

Destruction of brumbies, therefore, may be carried out in this district by stock owners at any time during the four months stipulated, provided that all formalities required by the Acts have first been observed.

Northern Pig Board—Traffic in Pigs.

An Order in Council under the Primary Producers' Organisation and Marketing Acts has been issued to deal with the traffic in pigs on the Atherton Tableland. The Acts now provide that all pigs grown in the Petty Sessions districts of Atherton, Herberton, Chillagoe, Cairns, Douglas, and Mourilyan must be delivered by the growers to the Board or its agents by the nearest road or railway, under conditions fixed by the Board by notice published in any newspaper circulating in the district. Except for delivery to the Board or its agents, a grower must not remove any of the commodity from his premises without the prior consent of the Board; any person doing so will be liable to a penalty of not more than £500.

No person shall remove any pigs except with a permit from the Board authorising him to do so. This permit will give the conditions and the period of duration for such removal, as determined by the Board. The Board may refuse to grant a permit without giving reasons. The permit must always be carried, and must be produced for inspection by any member or inspector of the Board or member of the Police Force. The Board may appoint persons to be inspectors.

Any member or inspector of the Board, or police officer, may at any place within a radius of 50 miles from the boundary of the area concerned, examine any vehicle suspected of carrying any of the commodity, may order the driver to stop for sufficient time to allow any goods carried to be inspected, and may seize any of the commodity found. Any person disobeying such orders shall be liable to a penalty not exceeding £500.

In any prosecution, the averment that pigs concerned are part of the commodity will be deemed to be proved in the absence of proof to the contrary. The Commissioner of Railways or any shipowner may, on the request of the Board, without incurring liability, refuse to carry any of the commodity, except interstate consignments.

Cotton Seed Importations.

The Minister for Agriculture and Stock (Mr. H. F. Walker) in a recent announcement stated that, following upon the request of a deputation of the members of the Cotton Board and grower representatives of the Central Queensland districts, he had inquired in both this country and in the United States of America as to the possibility of importing large quantities of cotton seed for planting purposes without risk of introducing dangerous insect pests and diseases. These inquiries have now been finalised, and it would appear that both the Commonwealth Quarantine Authorities and the United States Department of Agriculture are in agreement that there is no known fumigation treatment of cotton seed intended for planting purposes that can be guaranteed 100 per cent. effective. Having received such information, Mr. Walker stated he could not see his way clear to import 20 tons of seed, as requested by the deputation. As he had stated previously, it appeared that seed for a very large acreage would be applied for this season. The Australian spinners were also steadily increasing their output, so it would appear that both the cotton growing and spinning industries were developing to their rightful importance. When one traverses the districts where cotton has been grown successfully it could be appreciated to what dimensions the industry might develop. He was extremely anxious, therefore, that every possible step should be taken to prevent the future of it from being jeopardised. Insect pests and diseases already in Queensland were yearly taking serious toll from the cotton growers, and he did not want to do anything which might introduce more serious trouble.

He had accordingly cabled to the United States Department of Agriculture asking that 100 lb. of seed of each of the three most promising varieties which were introduced this last season be sent as early as possible. These amounts would allow of at least 10 acres of each variety being planted. As the increase from this past season's ¼-acre test plots would allow of around 15 acres of each variety being planted, it could be seen that with reasonable conditions sufficient seed would be available in the following year to plant several hundred acres of each.

Concluding, the Minister stated that he felt it to be far better to proceed in a cautious manner than make introductions of large amounts. It had to be remembered that all seed had to be planted in quarantine plots and all plants carefully examined. The acreage which the three 100-lb. lots could plant would be of such size that a careful enough inspection of it could be obtained to give reasonable assurance that any seed released would be free of serious pests or diseases.

Regulation Regarding Introduction of Poultry from Other States.

Early this year a regulation was passed under the Diseases in Poultry Act to prevent the introduction into Queensland of Newcastle disease of poultry (or pseudo-poultry plague) which was then prevalent in Victoria. Existing regulations at the time provided that poultry could only be introduced into Queensland on production of a declaration by the owner that such poultry were entirely free from disease and during the preceding three months had not been in contact with diseased poultry. Such declaration was accompanied by a certificate from an inspector of poultry whence the birds had come stating that he had examined them and had no reason to doubt the declaration.

However, when Newcastle disease broke out in Victoria, these regulations were amended to provide that as well as producing the declaration and certificate as above the owner of the poultry had also to produce a certificate from the Chief Inspector of Stock or Chief Veterinary Surgeon in the State from which the poultry had come stating that there had been no outbreak of Newcastle disease in that State in the preceding twelve months, and that such birds were the product of such State or had been in the State in the last preceding twelve months. In addition, he had also to deliver a permit to import issued by the Poultry Expert of the Department of Agriculture and Stock, Brisbane.

Victoria has now been declared free of Newcastle disease of poultry, and accordingly the restrictions against the introduction of poultry into this State have been withdrawn. A regulation has been issued to-day rescinding the regulation issued early this year, and this new regulation requires similar procedure regarding the introduction of poultry from other States as did the regulation which was in force previous to the outbreak of Newcastle disease of poultry.

Two Methods of Tanning Fur Skins.

Cut off the useless parts of the skin, and then soften it by soaking, so that all flesh and fat may be scraped from the inside with a blunt knife. Soak the skin next in warm water for an hour, and during that time mix equal quantities of borax, saltpetre, and Glauber salts with enough water to make a thin paste. About ½ oz. of each ingredient will give enough for an opossum skin, and proportionately more will be required for larger ones. When the skin has soaked in the warm water, lift it and spread it out flat, so that the paste may be applied with a brush to the inside of the skin; more paste will be required where the skin is thick than where it is thin. Double the skin together, flesh side inwards, and place it in a cool place for twenty-four hours, at the end of which time it should be washed clean, and treated in the same way as before with a mixture of 1 oz. of sodium carbonate (washing soda), ½ oz. borax, and 2 oz. hard white soap; these must be melted slowly together without being allowed to boil. The skin should then be folded together again and put in a warm place for twenty-four hours. After this dissolve 4 oz. alum, 8 oz. salt, and 2 oz. sodium bicarbonate (baking soda) in sufficient hot water to saturate the skin; the water used should be soft, preferably rain water. When this is cool enough not to scald the hands, the skin should be immersed and left for twelve hours; then wring it out and hang it up to dry. The soaking and drying must be repeated two or three times, till the skin is soft and pliable, after which it may be rubbed with fine sand-paper and pumice-stone to obtain a smooth finish.

A second method, in which wattle-bark is the tanning agent, is not so quickly accomplished, but properly adopted it should give better results than the other. Collect some wattle-bark and make a strong decoction by boiling or steeping the bark in water. A bushel of crushed bark from a tannery, if one is near at hand,

will be found an easy way of getting the best bark. The skin should be scraped clean on the inside, as in the "lightning process" before steeping begins. It is best to let the skins lie as flat as possible while soaking; and a large, square, zinc-lined packing-case is therefore preferable to a barrel. The skins should be thoroughly covered by the liquid, which must either be changed once a week, or boiled anew and skimmed. While the skin is out of the liquid each week it should be lightly scraped. Large skins take up to six weeks to tan well, but opossum skins will not require more than a month.

Tanning Hides.

First, the hide should be put in a mixture of lime and water, so that the hair can be scraped off easily. The hide should then be laid on a flat and clean surface and scraped on both sides to take off the hair, fat, meat, &c. It should then be left in clean water until the tan liquid is ready. The liquid consists of one 4-gallon bucket of wild peach or quondong bark added to 20 gallons of water. When cold, the hide can be immersed in the solution. Care should be taken that the tan is not too strong until the hide commences to show the colour of the liquid. Then the liquid can be made as strong as possible by adding more scalded bark. The addition of three buckets of bark will in most cases prove sufficient. All that remains to do is to air the hide once a week. The process will take three to four months. Care should be taken when airing the hide that it is not allowed to become dry and stiff. When the hide becomes heavy it is a sure sign that it is nearly tanned. After the side is tanned, it should be washed in two or three waters, but not allowed to become dry until the dressing is applied. When the tanner is applying the dressing—a mixture of mutton fat and beeswax—the hide should be hung over a rail, and the dressing well rubbed into the leather on the flesh side with a block of wood. The hide can then be left to dry until required for use. If the dressing is not applied, the leather will become hard and wrinkly, and will stretch, crack, and break when used. Any red bark will tan leather. Tanning a rabbit skin will take three weeks, a kangaroo skin six to eight weeks, and a hide three months.

How to Kill a Local Producers' Association.

Evidently the following nineteen suggestions for killing an association were written by one with experience in such matters, says the "Live Stock Journal."

1. Don't come to the meetings.
2. But if you do, come late.
3. If the weather doesn't suit you, don't think of coming.
4. If you do attend a meeting, find fault with the work of the officers and other members.
5. Never accept an office, as it is easier to criticise than to do things.
6. Nevertheless, get sore if you are not appointed on a committee, but if you are, do not attend committee meetings.
7. If asked by the chairman to give your opinion regarding some important matter, tell him you have nothing to say. After the meeting, tell everyone how things ought to be done.
8. Do nothing more than is absolutely necessary, but when other members roll up their sleeves and willingly, unselfishly use their ability to help matters along, howl that the association is run by a clique.
9. Hold back your subscriptions as long as possible, or don't pay at all.
10. Don't bother about getting new members. Let the secretary do it.
11. When a dinner or luncheon is given, tell everybody money is being wasted on "blow-outs" which make a big noise and accomplish nothing.
12. When no repasts are given, say the association is dead and needs a can tied to it.
13. Don't ask for a dinner or luncheon ticket until all are sold.
14. Then swear you've been tricked out of yours.
15. If you do get a ticket, don't pay for it.
16. If asked to sit at the speaker's table, modestly refuse.
17. If you are not asked, resign from the association.
18. Don't tell the association how it can help you, but if it doesn't help you, resign.
19. Keep your eyes open for something wrong, and when you find it, resign.

Where to Stay in Brisbane.

A convenient rendezvous for country people when visiting Brisbane is the Gresham Hotel in Adelaide street, near the Central Railway Station, and right in the centre of the city. There will be found all the amenities of a modern hotel, besides an atmosphere of genuine hospitality and real homeliness which no doubt accounts for the great popularity of "The Gresham" with the travelling public.

Well Balanced Rations Necessary in Pig Feeding—Value of Meat Proteins and Minerals.

The pig feeding trial conducted recently by the Department of Agriculture and Stock, demonstrated that maize, wheat, and barley all give satisfactory returns and produce first-grade bacon when used in rations balanced with protein-rich foods such as separated milk, and when minerals are included in the ration.

These results are of considerable interest to farmers, but when there is a scarcity of separated milk, the pig raiser must have some protein-rich food to take its place in balancing the grain in the ration and this substitute is readily available in the form of meat and bone meal (as Borthwick's "Mebo" meal advertised in this Journal). This Queensland-made stock food is in a very concentrated form, containing 54 per cent. protein and, owing to its percentage of bonemeal, is rich in phosphorous and lime, which are necessary minerals in animal nutrition.

"Mebo" is made fresh daily from the meat of cattle which are inspected by Government inspectors, and being free from possible disease infection is absolutely a safe food for pigs. Being such a concentrated food, it is only required in a small proportion in the ration and thus its use is quite economical. When separated milk is in short supply ¼ lb. to ½ lb. of "Mebo" might be fed daily to each 100 lb. of live pig.

All good pig feeders supply their pigs with a mineral mixture to ensure health, freedom from worms, and rapid growth in the stock.

Experimental work throughout the world has demonstrated the value of a complete mineral mixture for pig feeding, and wonderfully rapid growth has been recorded in pigs fed on well-balanced rations which include ample minerals.

Borthwicks' "Bonolik" is a well-blended mixture of such materials as sterilised bonemeal, salt, sulphur, sulphate of iron, sulphate of magnesia, and potassium iodide, all of which are known to be essential to the wellbeing of the pig.

Borthwicks' "Mebo" meal for use in place of separated milk and in conjunction with whey, and Borthwicks' "Bonolik" as an insurance of health and rapid growth in pigs have been on the market and in common use for some years, and their popularity testifies to their value.

"Mebo" meal and "Bonolik" may be fed either wet or dry in any combination of foods. Further particulars regarding their use will be freely given upon application to Messrs. Borthwick and Sons (Aust.) Ltd.

How to Feed.

Pigs.—Wheat, like maize, needs the addition of a supplement when fed to pigs. Any palatable roughage rich in protein is satisfactory. If the pigs are on good grass or lucerne pastures they will make rapid and economical gains when wheat is added to the diet. When stall-feeding with wheat it is advisable to include in the ration a food of animal origin that is rich in protein, such as skim-milk. Field peas are also of great value for feeding with wheat.

The wheat should be ground or rolled for pigs. This treatment has the effect of greatly increasing the feeding value. It should not be ground too finely, as it then tends to form a sticky mass in the mouth of the pig. Soaking the wheat is of very little value, and does not justify the trouble involved; moreover, it is not nearly so satisfactory as grinding.

Lambs.—The best results are obtained with lambs when the wheat is fed with legume hay. This has the effect of balancing the ration. Wheat fed to lambs on good pasture gives good results.

Cattle.—Wheat should be fed with some bulky concentrate for the best results with dairy cattle. It should be ground or rolled for all cattle.

Horses.—Wheat should be fed only in moderate amounts and mixed with a bulky concentrate or with chaffed forage. If fed in excess it may cause digestive troubles and skin eruptions.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

MEAT.

Mankind have always had a fondness for meat, when they could get it, on account of its rich savoury flavour. This is utilised in beef-tea, broths, and meat extracts, which have no nutritive value in themselves, as a vehicle for making other foods attractive. Meat is a source of iron, which is necessary for the formation of red blood. Iron is not contained in sufficient quantity in milk, but can be obtained equally well from egg yolk and green vegetables. The vitamins of meat will be discussed presently. It is as a source of proteids (body building foods) that meat is most valuable.

What the Child Requires.

Experience has shown that a liberal supply of proteids is necessary for the best physical development. They are most needed during childhood, youth, and adolescence. After growth has been completed proteids are only needed for repair of bodily waste, and a smaller quantity suffices. Especially after middle age we need little. As their name implies, proteids are of very varying as well as very complex chemical composition. We may classify our foods according to their value as sources of proteids as follows:—(1) Milk and cheese, (2) eggs, (3) meat, (4) fish, (5) peas and beans, (6) bread. Meat takes only the third place, not that in which it is placed by popular estimation.

Gluttony a Deadly Sin.

Because it is rich and savoury, meat is often eaten to excess. One holiday season I sat at a table for a few days with three stout women past middle age. They ate meat at every meal—that is, three times a day—large navvy's helpings. The other food they took, though not so conspicuous in quantity, would have been quite enough for their needs, without any meat at all. Between courses they talked about their ailments. They had a very firm belief that by eating plenty of strong food they were increasing their own strength. In reality they were inviting disease and shortening their lives. In the middle ages, gluttony was a sin; now we call it good living. Our forefathers were nearer the truth.

A Lesson from the Lion.

By meat most people mean steaks, chops, and joints—that is to say, fresh meat, which is muscle meat. Now, muscle is a very specialised animal tissue, and one of its peculiarities is that it contains scarcely any vitamins. It is a very serious thing that bread and meat, which are popularly supposed to be the two main foods, do not contain the vitamins necessary to support life. It is fortunate that we live on mixed diets, for on bread and meat alone we should soon die from some infectious disease. It is to be feared that many are unknowingly trying to exist on diets in which vitamins are relatively deficient, and that their health suffers in consequence. In contrast to flesh meat, liver, kidney, and other internal organs are extremely rich in vitamins, and are much more valuable food, though many people despise them. Savages and wild beasts know much better. When the lion has made his kill, he eats the liver, kidneys, heart, and lungs, together with any fat distributed among them. After this he carries the paunch and entrails away and hides them. Should he then not be satisfied, he returns to the carcass and takes away some of the flesh meat. All the rest he leaves to the jackals. But the jackals cannot live on flesh meat alone. They obtain the vitamins they require from ostrich eggs and ostrich chicks. Where there are no ostriches or other sources of vitamin containing food, jackals cannot live on the lion's leavings. We might learn something, even from lions and jackals.

YOUTH AND THE FARM.

The worst mistake made by the majority of our people is the lack of encouragement given to the boys, and even the girls, of the family to become really interested in farming or the sidelines of farming. The result is that the brainiest and most progressive boys look to city occupation, while the girls too often avail themselves of the first opportunity to obtain a little independence. No human being with any spirit at all could be content to go on working from year to year and be treated as a child, having clothes bought for him and occasionally receiving a few shillings when he goes to town.

And because of the prevailing selfish attitude of parents many fine prospective farmers are being forced off the land, just when we want men of their calibre to assist in making dairy farming the great business it can be made in this most favoured country. In grass-land farming and in herd-building management is the big factor; it is the man behind the gun that counts. Therefore we want the brilliant boys to remain on the land, and they will remain if they are treated as self-respecting human beings.

We believe the day will come when farm girls will be encouraged to take up poultry-keeping or bee-keeping as a sideline, and many of them would if they had the necessary encouragement.

I think it is true that fathers are quite as hard to train as boys, and from experience all along the line, it seems fairly certain that fathers and boys alike will mostly go their own way, in the long run getting "what is coming to them."

But it is in the power of the father to help a boy to realise his best instead of his worst tendencies and possibilities. To this end, a father must be sympathetic and patient, helping the development of whatever natural taste or genius a boy may have. Virtue is never negative, and a boy is held from idleness or vice by giving him something better to work at. If a boy has a real love for some study or for some worthy line of work, encourage that. It marks the way out from temptation. A boy needs in his development sympathy rather than financial help. His ideals need strengthening, not his purse. To have money to burn will ruin all those who burn it.

The father can promote the plain virtues of sobriety, honesty, tolerance, and kindliness. The most effective way of teaching these virtues is for him to illustrate them in himself to show how righteousness looks when it is lived. Right living can be most effectively taught not by precept but by practice. And remember always that right living is a positive thing. It is secured by inhibitions.

And a father may say to his boys something like this: "Your first duty in life is towards your afterself. So live that your afterself—the man you ought to be—may in his time be possible and actual.

Far away in the years he is waiting his turn. His body, his brain, his soul, are in your boyish hands. He cannot help himself.

Will you let him come, taking your place, gaining through your experience, happy in your friendships, hallowed through your joys, building on them his own?

Or will you fling it all away, deciding, wanton-like, that the man you might have been shall never be?

This is your problem in life—the problem vastly more important to you than any or all others. How will you meet it, as man or as a fool? It is your problem to-day and every day, and the hour of your choice is the crisis in your history.—The "New Zealand Dairyman."

KITCHEN GARDEN.

Our notes for October will not vary much from those for September. Sowing may be made of most vegetables. We would not, however, advise the sowing of cauliflowers, as the hot season fast approaching will have a bad effect on their flowering. French beans, including butter beans, may be sown in all parts of the State. Lima and Madagascar beans should also be sown. Sow the dwarf Lima beans in rows 3 feet apart with 18 inches between the plants. The kitchen garden should be deeply dug, and the soil reduced to a fine tilth. Give the plants plenty of room, both in sowing and transplanting, otherwise the plants will be drawn and worthless. Thin out melon and cucumber plants. Spraying for fungoid diseases should be attended to, particularly all members of the *Cucurbitaceæ* and *Solanum* families, of which melons and tomatoes are representative examples. Give plenty of water and mulch tomatoes planted out last month. Asparagus beds will require plentiful watering and a good top-dressing of short manure. Rosella seeds may be sown this month. No farm should be without rosellas. They are easily grown, they bear heavily, they make an excellent preserve, and are infinitely preferable to the mulberry for puddings. The bark supplies a splendid tough fibre for tying up plants. The fruit also makes a delicious wine.

THE COUNTRY WOMAN.

By arrangement with the Domestic Science and Technical Services of the Department of Public Instruction, information of especial interest to country women is published regularly under this heading.

SIMPLE COOKING

FRIED FISH.

Materials—1 whiting; yolk of 1 egg or 1 tablespoonful milk; 1 tablespoonful bread crumbs; 1 teaspoonful flour; pepper; salt; dripping; slice of lemon; parsley.

Utensils—Bowl; knife; whisk; frying-pan; plate.

Method—

1. Scale, clean, and fillet fish; wash fillets in salt and water.
2. Dry; roll in flour, pepper, and salt.
3. Dip in beaten egg or milk and bread crumbs.
4. Fry skin side down in smoking fat.
5. Drain on brown paper; serve hot with thin slice of lemon and sprigs of parsley.

STEAMED FISH.

Materials—1 whiting; 1 teaspoonful dripping; pinch of salt; ½ teaspoonful lemon juice.

Utensils—Bowl; knife; 2 plates.

Method—

1. Wash fillets of fish in salt and water; dry them well.
2. Place skin side down on a greased plate; sprinkle with lemon juice.
3. Cover with another plate.
4. Place on top of a saucepan of boiling water.
5. Cook for 10 minutes.
6. Reverse plates; cook 10 minutes.

MEAT RISSOLES.

Materials—1 lb. cold meat; 1 tablespoonful chopped parsley; 1 tablespoonful flour; yolk of 1 egg or 1 tablespoonful milk; 2 tablespoonfuls bread crumbs; 2 pinches salt; pepper; 1 tablespoonful dripping; 1 small onion; ½ cup of stock or water; dripping for frying.

Utensils—Knife; mincing-machine; wooden spoon; frying-pan; saucepan; plate.

Method—

1. Cut up meat into pieces.
2. Pass meat and peeled onion through a mincing machine.
3. Add chopped parsley; salt and pepper.
4. Heat 1 tablespoonful of dripping in a saucepan; add flour.
5. Stir well with a wooden spoon; add stock or water; boil till thick; add meat; remove from fire; spread out on a dish to cool.
6. Form into round balls; dip in flour and beaten egg or milk and bread crumbs.
7. Fry in smoking fat.

STEAMED ORANGE PUDDING.

Materials—¼ lb. dripping or butter; ¼ lb. sugar; 2 eggs; 1 orange; 6 oz. flour; 1 teaspoonful baking-powder; pinch of salt.

Utensils—Bowl; wooden spoon; lemon squeezer; grater; sieve; basin; greased paper; saucepan or steamer.

Method—

1. Put dripping or butter and sugar into a bowl.
2. Beat till creamy.
3. Add eggs one by one, beating all the time; add orange juice.
4. Add flour mixed with baking-powder; salt, and grated orange rind.
5. Pour into well-greased basin; cover with greased paper; steam for 1½ hours.

ARROWROOT SAUCE.

Materials—½ pint milk; 1 dessertspoonful sugar; 1 teaspoonful arrowroot; 4 drops of vanilla or lemon essence.

Utensils—Saucepan; cup; wooden spoon.

Method—

1. Put milk into saucepan; place saucepan over fire.
2. Blend arrowroot with a little cold water.
3. When milk in saucepan is at boiling point add arrowroot, sugar and essence; stir well.
4. Cook for 3 minutes; serve in a sauceboat or jug.

COFFEE.

Materials—½ pint water; 1 dessertspoonful coffee; pinch of salt; ¼ cup milk.

Utensils—Saucepan; dessertspoon; cup.

Method—

1. Put water, coffee, and salt into a saucepan.
2. Place on the fire; bring to the boil slowly.
3. Boil for 3 minutes; strain through muslin.
4. Place hot milk in a cup; add sugar.
5. Pour coffee in.

SEA PIE.

Materials—½ lb. steak; 1 dessertspoonful flour; 1 onion; 1 carrot; 1 turnip; 1 teaspoonful salt; pinch of pepper. For pastry: ¼ cup suet; 1 cup flour; ½ teaspoonful baking-powder; ½ gill water.

Utensils—Saucepan; basin; knife; chopping-board; rolling-pin; sieve.

Method—

1. Cut meat into small pieces; roll in flour; pepper, and salt.
2. Put meat into a saucepan; cover with water; add the prepared vegetables cut into dice.
3. Bring to the boil; simmer for 1½ hours.
4. Chop up suet; rub it into the flour, sifted with baking-powder and salt; mix with water into a thick paste; roll out.
5. Cover meat with pastry pressed out to the size of saucepan.
6. Make an incision in centre of pastry.
7. Place lid on; cook for half an hour.
8. Serve on a hot dish with the pastry cut into triangular pieces.

SALMON RISSOLES.

Materials—1 tin salmon; 1 egg or 1 tablespoonful milk; 1 tablespoonful lard or dripping; 1 tablespoonful flour; 2 cups bread crumbs; salt and pepper; dripping for frying.

Utensils—Tin-opener; saucepan; wooden spoon; fork; bowl; frying-pan; plates; cup.

Method—

1. Open tin; drain off liquor into a cup; remove salmon; break it up with a fork.
2. Heat lard in a saucepan; when melted, add flour; stir well.
3. Add liquor; boil for 3 minutes, stirring well; add salmon.
4. Add bread crumbs, salt, and pepper; mix well; remove from fire; allow to cool.
5. Make into small balls; dip in flour, beaten yolk of egg or milk, and bread crumbs.
6. Fry in smoking fat; drain on brown paper; serve hot.

GREEN PEAS.

Materials—1 lb. peas; ½ teaspoonful sugar; ½ teaspoonful salt; 2 sprigs of mint; ¼ teaspoonful carbonate of soda; ½ teaspoonful butter; pepper.

Utensils—Saucepan; basin; dish.

Method—

1. Remove shells; wash peas.
2. Put them into a saucepan of hot water.
3. Add mint, salt, sugar, and soda if the peas are old.
4. Boil gently without the lid for 15 minutes.
5. Drain; add butter and pepper; shake saucepan rapidly over fire; dish in a hot vegetable dish.

POTATO CHIPS.

Materials—½ lb. potatoes; ½ teaspoonful salt; ¼ teaspoonful pepper; 1 cup dripping.

Utensils—Bowl; knife; frying-pan; cloth; brown paper.

Method—

1. Wash potatoes; peel them thinly.
2. Cut into thin strips; dry.
3. Fry in smoking fat for 3 minutes.
4. Drain on brown paper.
5. Sprinkle with pepper and salt; serve hot.

BOILED CUSTARD.

Materials—½ pint milk; yolk of 1 egg; 1 teaspoonful cornflour; 1 dessertspoonful sugar; 4 drops vanilla; 1 dessertspoonful milk for blending.

Utensils—Saucepan; basin; wooden spoon; glass dish or custard cups.

Method—

1. Put milk in a jug into a saucepan half filled with boiling water over the fire; bring milk to boiling point.
2. Add cornflour blended with sugar and a little cold milk.
3. Boil for 3 minutes; remove jug from saucepan.
4. Add the beaten yolk of egg; return jug to saucepan.
5. Cook for 3 minutes, stirring all the time.
6. Add essence when cool.
7. Serve in custard cups or in a glass dish.

Note.—The white of egg may be beaten to a stiff froth, mixed with icing sugar and placed on top of the custard.

INVALID COOKERY.

Choice and Preparation of Food for Invalids.

IN cases of illness in which a doctor is in attendance the diet of the invalid is regulated by the doctor, not by the nurse. In such cases, the diet must be of a certain fixed type, and must be administered according to rule. A nurse who fails to carry out orders may cause the death of the patient.

In cases of simple ailments or slight accidents, the nurse may not have the direction of a doctor; common sense, knowledge of the patient, and the circumstances must then guide her in choosing and preparing food.

The points to be observed are—

(1) The diet must contain the right proportions of foodstuffs.

(2) The food must be easily digested.

(3) It must compensate for strain or waste caused by the disease or accident.

(4) It must be given in moderate quantities and often.

(5) Food must be served at stated times and punctually.

(6) Unused food must be removed from the sick room at once.

(7) In cases of infectious disease, remains of food must be burned without delay.

(8) For convalescents food should be varied.

(9) If change of food is inadvisable, the mode of serving it should be varied.

(10) The quality of the food must be good; milk, meat, fish, soup, and eggs must be perfectly wholesome; unripe or over-ripe fruit and vegetables must not be used in preparing food for invalids.

(11) Great care even in details must be taken in cooking for the sick; for example, better results are obtainable if earthenware vessels are used instead of those made of metal.

(12) Everything employed in preparing and serving food must be scrupulously clean.

Notes on Certain Preparations Used in Invalid Diets.

Jelly is of little use as food; animals fed on prepared gelatine die as soon as those not fed at all; milk jelly is only of the same value as the milk it contains.

Beef tea is not a food, it is a stimulant; to give beef tea alone to a sick person is to give him a stone when he asks for bread. (Dr. Fothergill, Author of "Dietetics.")

Stimulants are not foods; they are substances which enable the individual to make use of the energy stored up in fat and muscle. The stimulants commonly used are alcohol, tea, coffee, beef tea, and extracts of meat, such as bovril. Some of these substances are used to tide over a critical period in acute disease, or to stimulate digestion in a chronic case. Stimulants are given in small quantities at a time and at such intervals that the second dose is given before the effect of the first has worn off.

Some remedies are food, not physic. Cod liver oil is an example; it is the most digestible of the fats. Cream or any other fat, if it can be digested, serves the same purpose as cod liver oil.

Diet Lists.

In hospitals diet-sheets are drawn up to ensure that a patient receives the food suited to his illness and condition. These diets are given certain definite names in order that they may be referred to briefly without danger of misunderstanding.

Patients suffering from diseases or accidents which cause the temperature to rise above the normal are kept entirely on liquid food, and their diet is referred to as a fever diet. The liquid food constituting the diet is planned to be given in small quantities and often so that the nutriment needed by the patient may be supplied in the most digestible form, and so that irritation of the digestive tract may not be caused. Such irritation would result in increase of fever. The list given below as a Fever Diet is subject to modification by the doctor's orders:—

FEVER DIET.

Food.	Hours.													Totals in Ozs.						
	A.M.						P.M.													
	2	4	6	8	10	Noon : 12	2 12.30	4	5	6	8	10	Midnight : 12	Milk.	Water.	Cornflour.	Coffee.	Beef Tea.	Jelly.	Gruel.
Milk .. .. oz.			6 +				6 +			6 +			6 +	24	8					
and Water .. .. oz.			2				2			2			2							
Cornflour .. .. .. oz.				4 +										2		4				
and Milk .. .. .. oz.				2																
Coffee .. .. .. oz.		6			6			6				6					24			
Beef Tea .. .. oz.	8					8					8							24		
Jelly .. .. .. oz.							1												1	
Gruel .. .. .. oz.									6 +					2						6
and Milk .. .. .. oz.									2											
														28	8	4	24	24	1	6
		U	nl	es s		as	le	ep												

Succeeding diet lists include solid foods in the order of digestibility.

These lists are planned to suit the requirements of the patient in the different stages of sickness or convalescence.

Diets.

Article.		Hours.						Total.
		A.M.			P.M.			
		6	8	11	1	5	8	
Milk Diet—								
Porridge	.. oz.	8	..	..	..	..	..	8
Sugar	.. oz.	½	½	..	..	½	..	1½
Milk	.. oz.	6	2	..	..	2	..	10
Bread	.. oz.	..	4	..	..	4	1	10
Butter	.. oz.	..	½	..	..	½	..	1
Tea	.. oz.	..	1	..	..	1	..	2
Soup	.. pt.	..	..	½	..	..	..	½
Pudding ..	.. oz.	..	..	..	8	..	..	8
Gruel (sweetened) or broth	pt.	..	..	..	..	½	..	½
Note: One pint of milk twice daily for drinks	pt.	..	..	..	..	..	..	2
Fish Diet—								
Porridge	.. oz.	8	..	..	..	..	..	8
Sugar	.. oz.	½	½	..	..	½	..	1½
Milk	.. oz.	6	2	..	..	2	..	10
Bread	.. oz.	..	4	1	..	4	1	10
Butter	.. oz.	..	½	..	..	½	..	1
Tea	.. pt.	..	1	..	..	1	..	2
Soup	.. pt.	..	..	½	..	..	..	½
Pudding ..	.. oz.	..	..	..	6	..	..	6
Gruel (sweetened) or broth	pt.	..	..	..	..	..	½	½
Fish	.. oz.	..	..	..	6	..	..	6
Potatoes ..	.. oz.	..	..	..	6	..	..	6
Note: Half-pint milk twice daily for drinks	pt.	..	..	..	..	..	..	1
Meat Diet—								
Porridge	.. oz.	8	..	..	..	..	..	8
Sugar	.. oz.	½	½	..	..	½	..	1½
Milk	.. oz.	6	2	..	..	2	..	10
Bread	.. oz.	..	4	1	..	4	1	10
Butter	.. oz.	..	½	..	..	½	..	1
Tea	.. pt.	..	1	..	..	1	..	2
Soup	.. pt.	..	..	½	..	..	..	½
Pudding ..	.. oz.	..	..	..	6	..	..	6
Gruel (sweetened) or broth	pt.	..	..	..	..	..	½	½
Meat	.. oz.	..	..	..	4	..	..	4
Potatoes ..	.. oz.	..	..	..	6	..	..	6
Note: Half-pint milk twice daily for drinks	pt.	..	..	..	..	..	..	1

Vitamins and the Choice of Food.

Laboratory experiments on the feeding of animals with chemically pure foodstuffs led to the discovery that for the maintenance of life and health there must be present in the food small quantities of some unknown substances. These are called accessory food factors or vitamins. The existence of four distinct vitamins has been detected. It is shown that rickets and some other diseases are associated with a deficient supply of the A-vitamin; beri-beri is caused by the absence of the B-vitamin; and scurvy by the absence of the C-vitamin from the food. Many of the intestinal and other chronic disorders so common in civilised countries are traceable to the long-continued use of food poor in vitamins. In large towns a relatively small amount of natural foodstuffs is now consumed. Many foodstuffs are subjected to commercial processes, such as machine-milling, refining, desiccation, sterilisation, &c., and are robbed thereby of these indispensable substances.

The following table shows the distribution of vitamins in common foodstuffs:—

Accessory Food Factors or Vitamins.

TABLE OF FOODSTUFFS SHOWING VITAMIN DISTRIBUTION.

+ shows presence relatively.

Report of Committee appointed jointly by Lister Institute and Medical Research Committee.

Classes of Foodstuff.	Group A—Fat Solubles or Antirachitic Factor.	Group B—Water Solubles or Antineuritic Factor.	Group C—Antiscorbutic Factor.
Fats and Oils—			
Butter	+++	..	..
Cream	++	..	..
Cod liver oil	+++	..	..
Mutton fat	++	..	..
Beef fat or suet	++	..	..
Peanut oil	+	..	..
Fish oil, whale oil, &c. ..	++	..	..
Margarine prepared from animal fat	Value in proportion to amount of animal fat contained	..	..
Nut butters	+	..	..
Meat, Fish, &c.—			
Lean meat (beef, mutton, &c.)	+	+	..
Liver	++	++	..
Kidneys	++	+	..
Heart	++	+	..
Brain	+	++	..
Sweetbreads	+	++	..
Fish, white	..	Very slight if any	..
Fish, fat (salmon, herring, &c.)	++	Very slight if any	..
Fish, roe	+	++	..
Canned meats	..	Very slight	..
Cheese, Milk, &c.—			
Milk, cow's (whole), raw ..	++	+	+
Milk (skim), raw	..	+	+
Milk (dried), whole	Less than ++	+	Less than +
Milk (boiled), whole	Undetermined	+	Less than +
Milk (condensed), sweetened	+	+	Less than +
Cheese, whole milk	+	..	..
Eggs—			
Fresh	++	+++	..
Dried	++	+++	..
Cereals, Pulses, &c.—			
Wheat, maize, rice, whole grain	+	+	..
Wheat, germ	++	+++	..
Wheat, maize, bran	..	++	..
Linseed, millet	++	++	..
Dried peas, lentils, &c. ..	..	++	..
Soy beans, haricot beans ..	+	++	..
Vegetables and Fruit—			
Cabbage, fresh, raw	++	+	+++
Cabbage, fresh, cooked ..	..	+	+
Cabbage, dried	+	+	Very slight
Cabbage, canned	..	..	Very slight

FOODSTUFFS—*continued.*

Class of Foodstuff.	Group A—Fat Solubles or Antirachitic Factor.	Group B—Water Solubles or Antineuritic Factor.	Group C—Antiscorbutic Factor.
Swede, raw expressed juice ..	..	..	+++
Lettuce	++	+	..
Spinach, dried	++	+	..
Carrots, fresh, raw	+	+	+
Carrots, dried	Very slight	..	..
Beetroot, raw, expressed juice	..	..	Less than +
Potatoes, raw	+	+	..
Potatoes, cooked	..	..	+
Beans, fresh, raw	..	..	++
Onions, cooked	..	..	+ At least
Lemon juice, fresh	..	..	+++
Lemon juice, preserved ..	..	..	++
Lime juice, fresh	..	..	++
Lime juice, preserved ..	..	..	Very slight
Orange juice, fresh	..	..	+++
Raspberries	..	..	++
Apples	..	..	+
Bananas	+	+	Very slight
Tomatoes (canned)	..	..	++
Nuts	+	++	..
Miscellaneous—			
Yeast, dried	..	+++	..
Yeast, extract and antolysed	..	+++	..
Malt extract	..	+ In some specimens	..

None in.—Lard, olive, cotton-seed, cocoanut or linseed oil, cocoa butter; cheese from skim milk; polished rice, white wheaten flour, pure cornflour, &c.; custard powders, egg substitutes, prepared from cereal products; meat extract; beer.

NOTES.—Tomatoes: "In the Tomato the three vitamins A, B, C are present" (p. 102, "Vital Factors of Foods," Ellis and MacLeod).

Vitamin D (antirachitic) is present in cod liver oil, egg yolk, butter-fat, animal fats.

FRUIT PRESERVING.

It is inadvisable to make preserves from fruit gathered in wet weather or after heavy dew.

Points to be Observed in Bottling or Canning Fruit.

1. The bottles must be clean and thoroughly scalded before using; they should be put into a boiler with cold water and left in it till the water boils. Borax may be added to the water.

2. The rubbers must be perfect and fit well; two rings should be used if necessary.

3. While being filled, the jars should be placed on a wet towel folded so as to fill the hollows in the bottoms of the jars; better still, jars should be placed in a shallow vessel of hot water.

4. A knitting needle placed in the bottle helps to equalise the temperature.

5. When the bottle is filled to within half an inch of the top, a spoon or knife should be run round the sides of the jar to displace air bubbles.

6. The jars must be filled to overflowing with hot syrup, and sealed immediately.

7. Jars must not be allowed to stand in a draught while being filled and cooled; if exposed to wind they must be covered with a towel or other cloth.

8. When jars are emptied, washed, and dried, rubbers should be placed inside and the tops fastened on securely.

Syrup for Bottling or Canning.

Half a pound of sugar to one pint of water is sufficient for most fruits; for acid fruit such as gooseberries and quinces one pound of sugar may be used with one pint of water; this proportion is used if a heavy syrup is preferred. Syrup should be strained if necessary.

Time Allowed for Cooking Fruit.

1. All fruits must be cooked till tender.
2. Small fruits must be allowed to simmer slowly.
3. Hard fruits such as quinces and some varieties of pears must be cooked in water before adding the sugar; these fruits develop a better colour if allowed to remain covered till nearly cooked.

Preparation of Fruit for Bottling.

1. Any fruit that may be stewed is suitable for bottling.
2. The fruit used must be ripe, but not over-ripe.
3. It must be sorted; decayed and poor fruit must be rejected; rejected fruit if sound may be used for jam-making.
4. The fruit chosen for preserving must be washed clean; smaller fruits are then ready for bottling.
5. Larger fruits such as pears, peaches, or quinces must be peeled neatly and cut into convenient pieces; the seeds must be removed; pears and quinces should be washed after being peeled and corded; the skin of pineapples should be carefully cut off and all eyes removed; the pines may then be bottled whole, quartered lengthwise, or cut into slices; pineapples should be cooked in the bottles to retain their flavour.

Note.—Pines quartered lengthwise are said to retain most flavour.

Sealing with Wax.

Fruit may be kept in bottles, corked, and sealed with wax. The bottles must be filled with the cooked fruit and hot syrup. The corks should be softened by being dipped in hot water; they should then be forced into place and sealed with melted wax. If the wax bubbles, the bubble must be pricked and the cavity filled with wax.

For Bottling Wax.

1. Heat ½ lb. of powdered resin and one dessertspoonful of fat slowly in a tin dish; mix thoroughly.
2. For red wax add Venetian red; for blue add washing blue.

To apply wax, dip the neck of the bottle into the wax; twist the bottle round while removing it.

Wax for sealing may be made by melting together equal quantities of white wax and beeswax.

To Keep Bottled Fruit.

After fruit is bottled it must be carefully stored. The two points to be observed are—

(*a*) The temperature must be as low as possible;

(*b*) Light must be excluded.

If there is any difficulty in excluding light the jars should be wrapped in brown paper.

Jars should be examined a week after storing; if the fruit has settled and the juice is clear and free from air-bubbles, the preserves will keep indefinitely.

To Preserve Fruit in the Bottle.

1. Pack well-prepared fruit as closely as possible into glass jars.
2. Make a syrup using ½ to 1 lb. of sugar to 1 pint of water.
3. Fill up the jars containing fruit with syrup; place covers on jars loosely.
4. Place the jars on a towel or wooden rack in a boiler containing tepid water.
5. Keep the jars from knocking together by placing straw, chips, or other packing between them.
6. Allow the water in the boiler to come up to about 1 inch below the necks of the jars.

7. Boil till the fruit is cooked.

8. When the fruit is cooked, remove jars from the water and place them on folded wet towels.

9. Fill up the jars to the brim with hot syrup or fruit from one of the jars.

10. Wipe the neck of each jar; fit on the rubber; cover down and seal. If screw-top jars are used they must be screwed down at least twice while cooling and a third time before storing.

Notes.—

1. Ten to twelve minutes is enough for berries, currants, or other small fruits.

2. Twenty minutes to two or three hours may be necessary for peaches, quinces, or pears.

To Cook Fruit and Put It Into Bottles.

1. Make a syrup of ½ to 1 lb. sugar to 1 pint of water.
2. Put sufficient well-prepared fruit to fill a quart jar into the syrup.
3. Cook slowly till the fruit is tender.
4. Have bottles prepared according to direction A.
5. Wrap a towel wrung out of water round and under a bottle, put a knitting needle into the bottle.
6. Fill the bottle with cooked fruit and pour the syrup over it till the bottle is filled to the brim; remove knitting needle.
7. Fix the rubber in place; cover down lightly.

LAUNDRY WORK.

ORDER OF WORK.

(A) Preparation for Washing—

1. Mending.
2. Sorting.
3. Removing stains.
4. Soaking or steeping.

(B) Removal of Dirt—

5. Washing.
6. Boiling.
7. Straining.
8. Rinsing.
9. Bluing.

(C) Preparation for Use—

10. Starching.
11. Drying.
12. Mending (2).
13. Sprinkling.
14. Rolling.
15. Ironing or mangling.
16. Folding.
17. Airing.

(D) Care of Clean Articles—

18. Sorting.
19. Distributing.

NOTES ON LAUNDRY PROCESSES.

Sorting—

After soiled clothes are collected they must be sorted into two piles; pile A should contain articles that may be boiled; pile B those which may not be boiled.

A.	B.
(1) Table linen.	(1) Silk, white and coloured.
(2) Bed and body linen.	(2) Prints.
(3) Towels.	(3) Coloured muslins.
(4) Starched articles.	(4) Coloured linens.
(5) Muslins and laces.	(5) Flannels.
(6) Handkerchiefs.	(6) Other woollen clothes.
(7) Dusters and kitchen towels.	(7) Blankets.
	(8) Stockings.

Steeping—

Steeping preserves materials and lessens the labour of washing: the cold water and soap in which clothes are steeped softens and loosens dirt, thus making it easier to remove; less rubbing is required, therefore there is less strain on the material and less expenditure of energy.

Washing—

After being wrung out of the steeping water the clothes must be *washed* in clean warm water with soap, the cleanest things being taken first. All parts of the clothes should be well looked over; any dirty parts, such as neck and wrist bands, should have particular attention. Every part should be well soaped and one piece of material rubbed against another. A small nailbrush may be used for collars and cuffs. For heavy material, such as corduroy and moleskin, a scrubbing brush and corrugated washboard are needed. The water should be changed as soon as it becomes dirty.

Rinsing—

Both before and after boiling, rinsing is very important—before boiling, to free clothes from dirty water; after boiling, because if soap is left in the clothes it gives them a bad colour, and mixed with blue forms spots of ironmould. Tepid water should be used for the first rinsing after boiling, so as to get rid of the soap.

Boiling—

The boiler should not be more than three parts full of water. Enough soap should be shredded into the water to form a lather. When one lot of clothes are lifted out and another lot put into the boiler more water and soap must be added.

The order in which clothes should be boiled is—(*a*) Table-linen; (*b*) Cuffs, collars, and curtains; (*c*) Bed and body linen; (*d*) Handkerchiefs and towels; (*e*) Coarse things such as kitchen towels, &c.

Small things should be put loosely into a bag; this keeps them together, prevents their being torn, and is a protection against ironmould.

A period of 20 to 30 minutes is sufficiently long for boiling clothes. The water must not be boiling when the clothes are put in. It should be brought gradually to boiling point. Clothes should not be packed into the boiler too closely; there should be plenty of room to stir them about freely with a wooden stick. When boiled, the clothes must be lifted out carefully into a basket over a tub or drainer. When drained, they must be rinsed until free of soap.

Wringing—

Care must be taken in wringing, by hand or machine, not to wrench the material. Clothes must be evenly folded with selvedges together; tapes and buttons folded to the inside. To wring by hand, gather the material up in the left hand, place the right hand above the left, little fingers together, and wring from right to left the selvedge way of cloth or garment.

Bluing—

Solid or liquid blue may be used: solid is the better. The blue should be placed in the middle of a piece of flannel, a piece of calico should be put over the flannel, and the two materials tied tightly round the blue by tape or white string. The blue bag should be soaked in water and squeezed till the water in the tub is the right tint. The water should just be sufficiently blue to remove the yellow look given to clothes by soap. If blue is allowed to settle at the bottom of the tub the clothes will become streaky.

Note.—Too many clothes should not be placed at the same time in washing, rinsing, or bluing water.

Starching—

The best starch for laundry purposes is rice starch. Other kinds have coarser granules, and are not suited for fine work. Starch will not dissolve properly in cold water; it must be mixed with cold water; boiling water is then added. This causes the starch cells to burst, and a clear paste is formed.

Muslins and curtains require thicker starch than table-linen—the finer and more open the fabric the less starch it retains.

Borax is added to starch to give a gloss to linen. Wax is added to make the iron move over the fabric without sticking.

Drying—

Drying should be carried out in the open air where possible, the early morning air being the best, as it freshens and bleaches the clothes.

The clothes-lines must be firmly fixed at each end. Clothes should be hung to the line by the thickest part, and should be, as far as possible, in a natural position, a peg being firmly fixed near each end to secure them to the line.

Sheets and tablecloths should be put over the line crossways with the hem against the hem. A peg should be fastened a few inches from each selvedge, and one in the middle. Collars and cuffs may be strung together on tape, a piece of muslin or thin cotton being pegged over them to keep them free from dust or soot.

Unstarched clothes may be taken off the line, folded neatly, and placed in a clothes-basket ready for mangling.

Sprinkling, Rolling, and Cold Starching—

All starched and most unstarched clothes must be thoroughly dried and then damped so that the heat of the iron may be effective.

To Damp Clothes—

1. Spread out the clothes as flat as possible on a perfectly clean table.
2. Put a basin of clean lukewarm water on the right-hand side.
3. With the right hand sprinkle the water evenly over every part.
4. Fold each large article up evenly and neatly.
5. Pass all articles that will not be damaged through the mangle; roll up each article tightly.
6. Place in a basket, the bottom of which is covered with a clean cloth.
7. Cover over with a clean cloth; leave in a cool place.

Hints—

(*a*) Warm water is used for sprinkling, because cold water makes darkish spots appear on starched clothes.

(*b*) Small articles (such as handkerchiefs and serviettes) should be doubled, sprinkled, placed on top of one another until a fair thickness is obtained, mangled, and rolled up ready for ironing.

(*c*) Handkerchiefs may sometimes be mangled, rolled up tightly, and ironed without being dried.

(*d*) Clothes may be better ironed if they are allowed to stand for some hours after being sprinkled and rolled.

(*e*) The body of a dress shirt should be damped in the same way as other body linen, but the front and cuffs must not be sprinkled. If the linen is well damped above the cuffs and round the edges of the front, the cold starch will not enter the sides and sleeves.

(*f*) Collars and cuffs must be perfectly dry before being starched with cold starch. The cold starch must be entirely rubbed out of the linen.

(*g*) Tablecloths should be stretched into shape while damp. To do this the hems should be gathered up in the hands of two persons, one at either end, and the cloth pulled crossways until the linen lies evenly; it therefore requires two persons to fold a tablecloth correctly.

(*h*) Long lace curtains may be straightened in the same way as tablecloths, care being taken not to put too great a strain on the material.

(*i*) The fringes of d'oylies, quilts, towels, and tray cloths should be beaten while damp against the edge of a perfectly clean table to straighten the strands and to disentangle them.

(Next Month: Ironing and Folding.)

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

ROSES.

MERITS AND DEMERITS OF LEADING VARIETIES.

By G. H. HEERS, Department of Agriculture and Stock.

TO give some idea how new roses work out, I have prepared a list of all the novelties, personally tried for six years prior to 1929, with the following results:—205 tested (climbers and polanthas not included); 110 discarded altogether as being useless; 65 being further tested but mostly hopeless; 20 may be worth a place in our general lists; 10 have definitely proved worthy of recommendation and have come to stay. They are: Sou de H. A. Verschuren, Sensation, E. J. Moller, Margaret McGredy, Charles P. Kilham, Mrs. Lovell Swisher, White Ensign, Lady Helen Maglona, Empire Queen, Rapture.

I propose to give as briefly as possible, firstly, a reliable description of the leading sorts under each colour, with pointed comments for and against each variety. They will not be given strictly in order of merit, as this seems to me impossible.

Like ourselves, all roses have faults, and in consequence our impressions must vary from time to time in accordance with their behaviour for the time being; therefore, the particular variety which one may fancy to-day is superseded to-morrow, and so on.

REDS.

RED RADIANCE (H.T.) (Gude Bros., 1916).—Colour cerise red, an attractive night shade, and, with the exception of colour, it is like Radiance, from which it sported. The growth is excellent, foliage healthy and plentiful, and not affected by disease. Its big bouncing globular-shaped blooms are most fragrant and abundantly produced. It lends itself for cutting, and if cut early in the day before the flower is too open it holds its shape and colour for a long time. Like Radiance, it remains intact on the plant, and petals fall off together.

Comment: I should say its faults are shape, colour, and at times it burns, also, it is apt to ball, but only when not well grown and in bad weather. It is purely a garden and decorative variety, and if it is not wanted for exhibition purposes I think it is the most satisfactory red grown. A climber raised by the Pacific Rose Company (1927) promises to be of equal quality.

ETOILE DE HOLLANDE (H.T.) (Verschuren, 1919).—Dark red in the bud stage, opening to bright red which does not blue. It possesses a rich muscat perfume. The growth is vigorous, erect, and clean, with large healthy foliage. Blooms freely. Although not full the petals are large and of such good substance that they hold themselves in perfect shape for a fair time.

Comment: It is a weaker rose during our hot months, both as regards colour and petalage. I rather favour this rose in preference to Hadley, mainly because of its healthy constitution under all conditions and its true colour.

HADLEY (H.T.) (Montgomery, 1914).—Rich crimson to dark red with velvety texture, full and generally of perfect form, produced on long stems. Foliage attractive, and mildew proof. Sweetly perfumed. Very free flowering, generally set down as a vigorous grower.

Comment: I cannot agree about its growth being vigorous; it is often quite good, but generally I would class it as a rose of medium growth. Unfortunately, in many localities it is a bad doer, particularly on shaley, hilly country. It has pithy wood, and succumbs to scale diseases very quickly. The colour blues considerably, and it is a difficult matter to get this variety in a hard condition for pruning. Still, with all these faults, it is a grand rose. Like Etoile de Hollande, this rose took several seasons before its value was recognised in Australia. Climber raised by Teschendorff (1927) is also promising.

SENSATION (H.T.)) (Joseph Hill, 1924).—Scarlet crimson with maroon markings. Very large double and lasting. Perfumed. Very free flowering, and blooms are produced on long stems, good for all purposes, especially for cutting. Strong healthy growth.

Comment: Like Hadley, this rose has pithy wood, and does not transplant too well. Colour blues. This rose has done well with me from the first year of introduction, and it is only a question whether or not it should occupy first, second, third, or fourth position.

LAURENT CARLE (H.T.) (Pernet Ducher, 1907).—Velvety carmine colour, strongly perfumed with old damask scent as usually found in the old cabbage type. The blooms are fairly double and of good shape in their early stage, opening to large blooms. Good spreading growth and very free flowering. Has held its popularity against all comers.

Comment: Colour is not as vivid as some of our later reds; blooms have a tendency to divide, growth inclined to spread, but this can be rectified by pruning to an eye pointing upwards, which is contrary to what is generally recommended. Nevertheless, one of the best. A climber raised by Rosen (1923) is excellent.

FRANCIS SCOTT KEY (H.T.) (Cook, 1913). (Introduced into Australia 1922).—Deep cherry-red colour, blooms perfectly shaped, extra large, and very double. Remains good for a long period. Produced singly on strong erect stems, and at its best well nigh perfect. Growth is excellent.

Comment: This rose is so very double that it is inclined to ball, though apparently this fault is not so prevalent is Queensland as in the Southern States. Owing to its slow process of opening it is liable to get soiled in rainy or windy weather, but at its best it is a faultless bloom. I am afraid that some of our judges are inclined to associate the failings of this variety when on the show bench. Undoubtedly it is a great show rose in Queensland. Named in honour of the author of the "Star Spangled Banner."

LADY HELEN MAGLONA (H.T.) (A. Dickson, 1925).—Bright crimson red with dark shadings lightening to scarlet as the flower ages. Semi-double and inclined to globular shape. Very sweetly scented. A fairly good grower.

Comment: Somewhat like the Radiance family. If not well grown stems have a tendency to be weak-necked. Nevertheless, a very fine addition.

E. J. MOLLER (H.T.) (V. A. Moller, 1923).—The colour is an intense velvety red, deepening towards black, its sheen imparts brilliancy to the colour, which is most striking. The blooms are full, of medium size, and most freely produced on long, strong, rigid stems. Growth good, free, and clean, having only an occasional thorn. Foliage excellent, and resists mildew. Described as a garden and decorative.

Comment: Lacking in scent, and buds inclined to show a flat nose in early stage, which, however, open into remarkably well-shaped blooms. This rose has so many other good qualities that it should not be condemned on this account. If in the cooler season selected buds are cut before they open out and kept indoors one will get a perfect bloom almost black in colour. A Queensland-raised variety, and, although a prophet hath no honour in his own country, this rose will yet force itself into popularity in Queensland.

YVES DRUHEN (H.T.) (Bautois, 1921).—Velvety red, very dark cup-shaped semi-double flowers. Sweet and very free flowering. Blooms produced on long stems. Growth good.

Comment: This is an excellent garden and decorative variety; probably the colour lacks the sheen found in some of the other dark reds. No shape. It is very free flowering and a good healthy grower.

HOOSIER BEAUTY (H.T.) (Dorner, 1915).—Glowing crimson with darker shadings. Blooms are fairly full, large, and carried on long stems. Very sweetly scented. Good growth.

Comment: Preferred by some growers to Hadley; undoubtedly fine when at its best. Growth irregular, inclined to be thin, and flower stems weak at times; not as consistent as Hadley.

E. G. HILL (H.T.) (E. G. Hill, 1928).—Dazzling scarlet, developing into a pure red. Good form, full and freely produced on long stems. Light perfume. Growth good.

Comment: This is the latest addition to the reds, and should the growth of this variety prove to be good I will predict a quick rise to popularity. The colour is rather more vivid than most other reds.

STAR OF QUEENSLAND (H.T.) (John Williams, 1909).—Rich velvety crimson shaded maroon. Semi-double cup-shaped flowers. Scented; good clean growth; foliage resists mildew.

Comment: This is so well known that little need be said about it. Petals are somewhat irregular in size, a good colour, and suits our climate well. Although still a favourite, it is being shoved further down the list each year.

Other reds that cannot well be overlooked are: Crusader, Dr. Hawkesworth, Etoile de France, F. J. Harrison, General McArthur, Lord Charlemont, Daily Mail Scented, Mrs. Henry Winnett, Rhea Reid, Royal Red, George Dickson.

RED AND WHITE.

PENELOPE (T.) (John Williams, 1906).—Colour of lower part of bloom is dark reddish crimson, while the centre is a creamy white. The colours are well defined, making an unique combination quite distinct from any other rose in commerce. Blooms are full and well shaped, with strong guard petals, faint tea scent. Very free flowering. Growth usually strong and bushy, but plants frequently fail to do well.

Comment: This is a grand rose in Queensland, particularly in the Central and Northern Queensland. It is subject to mildew, and the plant difficult to manage. Requires rich soil, and will do much better if left to itself; it resents the knife. The blooms are good for any purpose. The most definite two-toned rose grown.

PINKS.

RADIANCE (H.T.) (J. Cook, 1908).—Brilliant silvery pink, with reverse of petals carmine. Globular shape, and very fragrant. Very free flowering, and growth upright and good.

Comment: The only thing that can be raised against this most popular rose is that it usually comes flat-nosed, and therefore is seldom fit for exhibition. Its growth is excellent, being vigorous, clean, and healthy; great abundance of beautiful sweetly scented flowers, well carried on long stems. The blooms hold together on the plant, always looking attractive until exhausted, when the whole of the petals fall together, so that the fine attractive bush never looks untidy with withered and soiled blooms. If I only had room for one rose it would be a Radiance, and if I had room for twenty-four I would have at least four Radiances. Probably more at home in Queensland than anywhere else in the world.

MAD. ABEL CHATENAY (H.T.) (Pernet Ducher, 1894).—Bright carmine rose, shaded pale vermillion rose and salmon, the colours harmonising well. Blooms are not large, but perfectly shaped, free, and a strong grower.

Comment: This rose will give the greatest satisfaction in any collection. Every bloom is good, and comes on long stems, and if cut to prevent seed pods forming will respond quickly with fresh flowering shoots. It is a strong grower, but has a tendency to throw its main growth in one direction, making it difficult to manage near paths. The only reason I would discard this variety would be to grow it in the climbing form, which is even better.

MRS. C. J. BELL (H.T.) (Pierson, 1917).—A sport from Radiance. The colour is a delicate shell-pink, otherwise it is a counterpart of its parent.

Comment: Where the very delicate colour is not objected to it is almost equal to Radiance and Red Radiance. It has a tendency to come too pale in the very hot weather, and I fancy that the flowering stems are scarcely as rigid as either of the other two mentioned. Dixie and Salmon Radiance are identical. Where roses are also wanted for exhibition this must go further down the list. A great trio—Radiance, Red Radiance, and Mrs. C. J. Bell. All three should be in the first dozen in this State.

MAMAN COCHET (T.) (Cochet, 1892).—Carmine pink, large double blooms of fine form and substance; free flowering and vigorous grower.

Comment: This variety is very popular throughout Queensland, is easy to grow, and is a consistent prize-winner. Requires light pruning, otherwise the blooms are inclined to come divided. It is scentless, and stems are often incapable of holding the heavy blooms. Very healthy, and disease resistent. The flowering stems are stronger on the climber, which is also extra vigorous.

JONKHEER J. L. MOCK (H.T.) (Leenders, 1909).—Carmine buds of gigantic size, opening to enormous blooms of deep carmine, against which the reflecting petals show an inner surface of silver rose, usually of good shape, produced on very rigid stems. Clean, strong, upright growth.

Comment: This rose appears to be well suited for Queensland, and, although it balls occasionally, and may also soil during wet weather, it is a very desirable variety. Grows rather tall, and should be pruned back and outward. A good show rose, although some judges regard it as coarse. Strong foliage, but sparse on lower stems. The large, bold, two-toned blooms of this variety make a fine show in Brisbane gardens during autumn months.

PRISCILLA (H.T.) (A. N. Pierson, or Montgomery, Incorporated, 1922).—True rose pink, paling to a lighter shade as the flower expands. Every shoot produces a large well-shaped bloom of good substance, which stands erect on a long stem; lasts well when cut. Reliable bloomer and good growth.

Comment: This rose was sent out in 1922, and it is said that the raiser withdrew it from commerce in America owing to adverse reports. If this is so it is very evident that it is much more at home in Queensland, and I am going to predict that it will become one of our most popular sorts. It certainly blues a little, and may also ball at times, but it is so good that it will be wanted wherever seen, especially amongst exhibitors. Strangely it is a cross of two whites—K. A. Victoria and Frau Karl Druschki—but both these whites had pink parents; K. A. Victoria-Lady Mary Fitzwilliam, asd F. K. Druschki-Mad. Caroline Testout, which may account for the delicate shade of Priscilla.

MRS. JAMES CRAIG (H.T.) (Hugh Dickson, 1908).—Salmon rose with shadings of pale yellow, full, and of good form in early stage, opening very full; fragrant; free bloomer and a good grower.

Comment: This variety appears only to be listed in Queensland. It is an excellent rose for all purposes. The colour, which is on the dark side for a pink, intensifies with age. A strong healthy grower, and very thorny.

COLUMBIA (H.T.) (E. G. Hill, 1917).—A true bright pink, deeping with age; very full and highly perfumed. Good clean, erect growth. Flowers produced on long stiff stems.

Comment: This variety's worst fault is that the blooms frequently become crippled in the process of opening. The petals are also rather short in the centre. Nevertheless, it is well worth growing, as it gives many perfect blooms, and even the defective flowers are quite good for cutting. The climber raised by Totty (1923) is even better.

MRS. GEO. SHAWYER (H.T.) (Lowe and Shawyer, 1911).—Clear brilliant rosy pink; extra long, slender, finely formed buds. Blooms large semi-double. Free flowering and good grower.

Comment: This rose is highly prized by exhibitors on account of its size and perfect shape. Unfortunately, the plant is subject to mildew. The climber raised in 1925 is even superior.

MABEL TURNER (H.T.) (H. Dickson, 1923).—Deep salmon pink, with reflex of petals a silvery tone. The blooms are extra large, pointed, and well formed. Faint tea perfume; growth strong.

Comment: This variety is capable of producing some fine exhibition blooms, but has a tendency to come coarse and weaker in colour if plants are forced. Not free from mildew. A good rose, and deserves to be better known.

MRS. BRYCE ALLEN (H.T.) (A. Dickson, 1916).—Carmine rose; very double, and opens somewhat flat in the way of Ilchester. Strong damask perfume; growth good and healthy.

Comment: A good all-round variety, rather dark to place with pinks. Flowers mostly come several together, and if wanted for show should be disbudded.

ETHEL SOMERSET (H.T.) (A. Dickson, 1921).—Shrimp pink, edge of petals deep coral pink; large and high pointed, stiff shell-shaped petals of good substance, in all forming a perfect bloom. Fragrant and a free bloomer. Growth good.

Comment: This is a fine variety, and should be better known. Its only fault is that it is subject to mildew. Occasionally we find a plant that fails in growth.

Other good pinks are: General Superior Arnold Janssen, Empire Queen, Rapture, Sunny South, Peggy Bell, Mad. Jules Grolez, Duchess of Sutherland, Mrs. Curnock Sawday, Mrs. W. E. Lenon, Mad. Segond Weber and Rose Marie in climbers (as the dwarfs of these are unsatisfactory growers).

WHITES AND LIGHT SHADES.

FRAU KARL DRUSCHKI (H.T.) (Lambert, 1900).—Pinkish buds and magnificent snow-white blooms with deep firm petals, produced on strong stems. Vigorous growth.

Comment: The best white rose of any class, whose main drawback is scentlessness. Although only semi-double, the great petals form a flower of unimpeachable shape. For best blooms the side buds should be removed when very young. Show blooms should be cut early, as this retards opening. May be kept in continuous bloom by cutting about one-third of the canes away as these ripen, to be followed by the prompt removal of flower stems back to two or three eyes. Plant requires plenty of room.

WHITE ENSIGN (H.T.) (McGredy, 1925).—Colour pure white, flushed delicate cream and bluff centre; full well-shaped in early stage, and always open well, with plenty of substance. Very free flowering. Faint tea scent. Good branching growth.

Comment: Although this rose is not as pure in colour as some other whites, its general qualities make it a most desirable variety, and should be included in all collections. Fit for show if disbudded and properly grown.

WHITE MAMAN COCHET (T.) (Cook, 1897).—A white sport from Maman Cochet, with faint pink flushings. Very full, long, and finely shaped. Free flowering, and a vigorous grower.

Comment: This rose also sported with Mr. Marshall in Brisbane about the same time, and the most of those grown in Queensland are from his strain. The blooms are even superior to the pink parent, and has probably accounted for more prizes than any other variety in Queensland to date. Should be pruned lightly and not seriously disbudded, otherwise blooms are inclined to come with a confused centre.

Does well all over Queensland. The climber raised in 1907 is even better, as the stems appear to be more able to hold up the heavy blooms, which is a weakness; also, it is scentless.

MRS. HERBERT STEVENS (T.) (McGredy, 1910).—Pure white, occasionally showing traces of pink on the outside. Semi-double, but holds to a fine pointed shape in the cooler weather. Tea scented, and very free flowering. Usually good growth.

Comment: The variety fails to grow well in some localities, and in such instances the blooms are thin and generally poor. If well grown will produce exquisite show blooms, which are hard to beat. It is an extraordinarily free bloomer, but unfortunately lack of petalage causes it to open up too quickly all through our summer months. The climber raised by Pernet Ducher (1922) is decidedly better, as the extra vigour appears to give the petals more stamina. I consider this variety the best white climber to date.

KOOTENAY (H.T.) (A. Dickson and Son, 1917).—Creamy white, shaded primrose; blooms in the way of K.A.V., but not as pure in colour. Very full, large, and rounded form, with petals of good substance. Free bloomer, with strong upright growth.

Comment: This rose is placed before K. A. Victoria on account of its better growth and profusion of blooms. It deserves to be better known, still it is not nearly as perfect as K.A.V.

K. A. VICTORIA (H.T.) (Lambert, 1891).—Creamy white, with a faint lemon tinge at the base of petals. Blooms are large, well formed, and seldom faulty, fragrant, and very freely produced.

Comment: This old standard variety, although handicapped with a rather weak habit of growth, is still unsurpassed for its extreme loveliness and faultlessly shaped blooms. The climber raised by A. Dickson (1897) is equally good with the advantage of growth. Mrs. H. R. Darlington and Perle von Godesberg, although carrying perhaps slightly more yellow at the base, are so nearly like K.A.V. that these need not be repeated.

KONIGIN LUISE (H.T.) (Weigand, 1927).—Colour white with a greenish tinge, described by the raiser as a greatly improved K.A.V. Blooms are fairly full, built of large petals forming a high bloom. Good growth.

Comment: This is a new rose, showing great promise; the blooms are well up to description, and growth appears to be better than K.A.V., and altogether promises to be a great acquisition to the white section.

W. R. SMITH (T.) (Smith, 1908).—Pale fresh colour, mottled with cream and pink. Blooms full and well formed. Very free; growth vigorous.

Comment: Where the colour is not objected to, this is a fine hardy variety to grow. Although fit to show, blooms are mostly squatty. The growth is extra vigorous, and few roses produce the quantity of blooms this variety does. Very healthy, and no rose is more free from mildew and other diseases. Tea scented.

MRS. H. BROCKLEBANK (H.T.) (A. Dickson and Son, 1907).—Creamy white with buff centre, tinted rose on outside of petals. Blooms are large double and of good shape. Strong tea scented, and very free blooming.

Comment: This is a good all-round rose, and if shaded may be turned out quite yellow, though ordinarily it must be classed amongst the light shades. A good free grower and bloomer, but not entirely free from mildew.

ANTOINE RIVOIRE (H.T.) (Pernet Ducher, 1896).—Creamy flesh, deeper in centre. Blooms are large, opening well. Tea scented. Growth strong and upright.

Comment: This is an old favourite which still has many admirers. When well grown will produce blooms of exhibition quality. Blooms last well even after opening, which accounts for the frequency with which it wins in the bud to full bloom classes. Free from mildew. The parent of quite a number of the later day roses.

CALEDONIA (H.T.) (Dobbie, 1928).—A pure white, splendid form, fairly full, and stands erect on good stems. Good growth.

Comment: This is a very promising new white, and unlike most white roses it has a strong honey-like perfume. It is, however, too early to definitely pronounce it as a variety of merit, though everything points to its being a good acquisition to our limited list of whites. Its growth and blooming propensities have still to be proved.

MCGREDY'S IVORY (H.T.) (McGredy, 1929).—Creamy white, full, and of good shape, buds being high and pointed. Damask perfume; good growth.

Comment: Like Caledonia, this variety has already given us some wonderful blooms, but it is too early to predict for its future. Also known as Portadown Ivory.

Other good whites and light shades are: Mrs. Chas. Lamplough, Louise Crette, also Climbing Ophelia.

YELLOW, BRONZE, AND ORIENT SHADES.

GOLDEN DAWN (H.T.) (P. Grant, 1929).—Rich sunflower yellow, flushed with deep old rose. When open the flowers fade to lemon-yellow. Blooms large, fairly full, and of good form. Rich tea scent; free bloomer, and a vigorous healthy grower.

Comment: This rose is occasionally enriched with carmine stainings, when it rivals Rev. F. Page Roberts in colour. Its growth is all that can be desired, and it should not be long in asserting its superiority amongst yellows. Although naturally a fine vigorous grower, there are instances where the growth has been disappointing. However, this is probably due to the fact that many people, being anxious to try this new Australian variety, removed old plants to make room to plant Golden Dawn in worn-out positions. Also anticipating a big demand, nurserymen may have over propagated during the novelty period. Although it should be well grown, flowers should not be forced, as this brings coarseness and misshaped blooms. Although sent out primarily as a garden variety, it is a great show rose in Queensland.

SOU DE H. A. VERSCHUREN (H.T.) (Verschuren, 1922).—Cadmium yellow, passing to orange towards the centre. Fairly full large blooms of exquisite shape, produced singly on strong stems. Free flowering, and strongly scented. Growth good.

Comment: An improved Hybrid Tea yellow. Holds its head erect, and fades less than most yellows. Colour being intense in cool seasons. A good strong productive plant, and usually free from disease.

GOLDEN OPHELIA (H.T.) (R. B. Cant and Sons, 1918).—Golden yellow, the heart being especially rich and shading lighter towards the edge of the petals. The blooms are naturally of medium size and of perfect shape, not full; produced singly on long stems. Sweet and very prolific. Good healthy growth.

Comment: A very rich and finely shaped flower, not supposed to be large enough for show purposes, but by disbudding and growing well I have seen Golden Ophelia well nigh perfect. Its definite faults are paling in the hot weather, and it has a tendency to mildew. Always in great demand for the cut flower trade. Quite a gem.

ALEX. HILL GRAY (T.) (A. Dickson, 1911).—Pure lemon-yellow, full and of perfect shape. Free blooming and nicely perfumed. Clean upright growth and thornless.

Comment: This rose is probably the purest and the best shaped of the pale yellows. Very hardy and healthy, and produces fine show blooms of much purity, which are very reliable except that they may ball and soil in excessive wet weather. Pithy wood with long joints and difficult to prune. Growth straight and upright.

ELEGANTE (H.T.) (Pernet-Ducher, 1918).—Charming yellow flowers with starry outline. Buds medium full, long pointed centre, petals reflexing perfectly. Free blooming; good strong spreading growth, with mildew-proof foliage.

Comment: Although it is not at its best during summer, it is rightly named, for its elegance of design and soft restrained colour, which does not bleach. A great show rose. Nice habit of growth. Just a few more petals would make it perfect.

REV. F. PAGE ROBERTS (H.T.) (R. B. Cant, 1921).—Coppery red buds, opening to golden yellow blooms, stained on the outside with rich salmon and carmine. The blooms are large, double, and finely formed. Very free flowering on strong stems, with healthy foliage.

Comment: A supremely gorgeous rose, developing to surpassing magnificence of size, colour, and fragrance. Very free flowering, with strong fruit scent. Growth, however, is its downfall, never looks like making a decent bush, and gradually dies back to such an extent that it is eventually dug out in disgust. However, it is so good that it should be persevered with by growing young plants, which usually do well for a couple of seasons. So far as the actual bloom is concerned, it is a real champion.

LADY HILLINGDON (T.) (Lowe and Shawyer, 1910).—Rich saffron yellow, paling towards the edges and fading as the bloom expands. The blooms are semi-double and freely produced on long wiry stems. Full tea scent. It is a good clean grower, with attractive foliage.

Comment: The blooms would be more aptly described as semi-single, nevertheless it is most attractive in the early stages. Free from mildew and should be well fed, so as to improve the flower stem. A delightful decorative and very popular with the ladies. A climber raised by Hicks (1917) has all the good points of the dwarf with the extra vigor.

MARGARET MCGREDY (H.T.) (H. Dickson, 1923).—The true colour is geranium lake or orange scarlet. The flowers are large, full, and of good form, freely produced. Growth sturdy.

Comment: This rose has every appearance of being a "Pernetiana," very thorny and foliage shiny. So far the growth and stamina appear to be quite satisfactory. The colour is wonderfully rich, and quite new in full-bodied roses. A real advance in highly-coloured roses, and can be safely recommended.

CHAS. P. KILHAM (H.T.) (Beckwith, 1926).—Brilliant orient red, fading to Lincoln red as it opens. The blooms are moderately full, and are produced on stiff stems. Fruit scented; fairly good growth, with healthy foliage.

Comment: One of our new highly-coloured varieties that will be always in demand. It has a tendency to grow lop-sided, and is not as sturdy as Margaret McGredy, but the colour has more brilliancy.

MRS. DUNLOP BEST (H.T.) (Hicks, 1916).—Reddish apricot, with a coppery yellow base. Semi-double flowers. Very free blooming; rich tea scent. Growth vigorous, and foliage good and healthy.

Comment: Although this rose is rather thin for our summer, it is so good and rich in colour during autumn to spring that it is well worthy of a place in every collection. The foliage is dark, long and serrated, providing a nice counterpart with its colours, and is even ornamental when not in bloom. Does particularly well on the Downs.

TALISMAN (H.T.) (Montgomery, 1929).—Rich shadings and blendings of scarlet, pink, gold, and copper difficult to portray. It is not full, but buds stand erect on straight stems; open blooms paler, but always attractive. Foliage light-green, free, and apparently good growth.

Comment: This is the most wonderfully coloured rose ever raised, especially in its early stage. The petals are of even length, and stand rigidly, crinkling as they open. Very free blooming, and has a wonderful perfume. The growth is upright, free and wiry. Its definite fault to date is that periodically it loses much of its colour, and comes yellow, but this fault is only temporary. It is purely a decorative variety, but provided its growth does not fail us it will soon become one of the most popular roses grown.

MEVROUW G. A. VAN ROSSEM (H.T.) (G. A. Van Rossem, 1926).—Colour orange and apricot, flamed and shaded over a dark golden yellow ground; in the early stages the reverse of petals are often bronzed. Blooms medium size, moderately full, and inclined to be globular in shape; fragrant and fair growth.

Comment: This is one of the newer roses which has improved each year. The colour is extraordinarily rich, and, although we are suspicious regarding its relationship to the Pernetianas, it appears to be growing satisfactorily, and may now be classed as very promising.

I would always recommend that room should be found for a climbing Perle des Jardins, the purest and sweetest of all yellows; also climbing Mrs. Aaron Ward and climbing Sou de Claudius Pernet should not be overlooked. Other good varieties under these colours are: Luna, Sou de Mad. Boullet, Mrs. Erskine Pembroke Thom, Mrs. Lovell Swisher, and Hugo Roller.

AN EFFECTIVE RAT TRAP.

One of the best methods of trapping rats is to get a small barrel or a water-tight chest and fill it rather more than half-full of water. Over the top spread a sack or piece of canvas, having a hole just large enough to admit a full-grown rat in the middle. Fasten it down taut all round. Spread a fairly thick layer of cork or chaff or both on top of the water, and suspend a lump of cheese, meat, or a piece of fish from under the sacking or canvas, and just beyond the reach of the rats. The stronger the scent of the bait the better. Scatter a handful of loose straw or hay on top of the box or barrel, and place a board against it so that the rats may readily find their way to the top. The barrel, it need hardly be said, should stand in a shady corner near where the rats have their burrows or run. See that they are not disturbed by cats. A little bait on the top of the trap vessel will naturally induce them to search for more, and scenting the feast within the vessel they will plunge to their doom one after the other. As many as thirty-eight rats have been caught this way during a single night. Rats can swim, of course, but with the surface of the water within the barrel about a foot from the top they are unable to jump out and soon drown.—"Farmers' Advocate" (South Africa).

Orchard Notes for October.

THE COASTAL DISTRICTS.

OCTOBER is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture is again emphasised. Unless there is an adequate supply of moisture in the soil to meet the trees' requirements, the coming season's crop will be jeopardised, as the young fruit will fail to set.

Thorough cultivation of all orchards, vineyards, and plantations is therefore imperative if the weather is dry, as the soil must be kept in a state of perfect tilth, and no weeds of any kind must be allowed to grow, as they only act as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants. Should the trees show the slightest sign of the want of moisture, they should be given a thorough irrigation if there is any available means of doing so, as it is unwise to allow any fruit trees to suffer for want of water if there is a possibility of their being supplied. Intermittent growth, resulting from the tree or plant being well supplied with moisture at one time and starved at another, results in serious damage, as the vitality is lessened and the tree or plant is not so well able to ward off disease. A strong, healthy, vigorous tree is frequently able to resist disease, whereas when it has become debilitated through neglect, lack of moisture or plant food, it becomes an easy prey to many pests. If an irrigation is given, see that it is a good one and that the ground is soaked; a mere surface watering is often more or less injurious, as it is apt to encourage a false growth which will not last, and also to bring the feeding roots to the surface, where they are not required, as they only die out with a dry spell and are in the way of cultivation. Irrigation should always be followed by cultivation, so as to prevent surface evaporation and thus retain the moisture in the soil.

All newly planted trees should be carefully attended to, and if they show the slightest sign of scale insects or other pests they should receive attention at once. All growth not necessary to form the future tree should be removed, such as any growths on the main stem or main branches that are not required, as if this is done now it will not only save work later on, but will tend to throw the whole strength of the tree into the production of those limbs that will form the permanent framework of the tree. In older trees all water sprouts or other similar unnecessary growths should be removed.

Keep a good lookout for scales hatching out, and treat them before they have become firmly established and are coated with their protective covering, as they are very easily killed in their early stages, and consequently much weaker sprays can be used. The best remedies to use for young scales hatching out are those that kill the insects by coming in contact with them, such as miscible oils, which can be applied at a strength of 1 part of oil in 40 parts of spraying material, and will do more good than a winter spray of double the strength. In the use of miscible oils or kerosene emulsion, always follow the directions given for the use of those spraying materials, and never apply them to evergreen trees when they are showing signs of distress resulting from a lack of moisture in the soil, as they are then likely to injure the tree, whereas if the tree is in vigorous growth they will do no harm whatever.

All leaf-eating insects should be kept in check by the use of an arsenate of lead spray, taking care to apply it as soon as the damage appears, and not to wait till the crop is ruined. Crops, such as all kinds of cucurbitaceous plants, tomatoes, and potatoes are often seriously injured by these insects, and the loss occasioned thereby can be prevented by spraying in time. In the case of tomatoes and potatoes, a combined spray of Bordeaux or Burgundy mixture and arsenate of lead should be used, as it will serve the dual purpose of destroying leaf-eating insects and of protecting the plants from the attack of Irish blight.

Grape vines require careful attention, and, if not already sprayed with Bordeaux mixture, no time should be lost in applying this material, as the only reliable method of checking such disease as anthracnose or black spot and downy mildew is to protect the wood and foliage from the attack of these diseases by providing a spray covering that will destroy any spores that may come in contact with them. The planting of bananas and pineapples can be continued during this month. See that the land is properly prepared and that good, healthy suckers only are used. Keep

the plantations well worked, and allow no weed growth. Keep a very careful lookout for fruit flies; destroy every mature insect you can, and gather and destroy every fallen fruit. If this is done systematically by all growers early in the season the subsequent crop of flies will be very materially decreased. See that all fruit sent to market during the month is carefully handled, properly graded, and well packed—not topped, but that the sample right through the case or lot is the same as that of the exposed surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Much of the matter contained under the heading of ''The Coastal Districts'' applies equally to these parts of the State; for on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit is very largely dependent. All orchards and vineyards must be kept in a state of perfect tilth, and no weed growth of any kind should be allowed. In the Western districts, irrigation should be given whenever necessary, but growers should not depend on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be carefully looked after, and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus diseases on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, two or more sprayings with Bordeaux mixture can be tried, as they will tend to check other fungus growths, but at the same time the sodium or potassium sulphide sprays are more effectual for this particular disease and should be used in preference when the fruit is nearly full grown. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codlin moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not already been treated, don't delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop won't take long to harvest.

Where new vineyards have been planted, spraying is also very necessary, as if this is not done the young leaves and growth are apt to be so badly affected that the plant dies.

Farm Notes for October.

Field.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore, our advice for last month holds good with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, cowpeas, sorghums, millet, panicums, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants from preparing the ground to harvesting the crop, to which our readers are referred.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

Date.	September, 1931. Rises.	September, 1931. Sets.	October, 1931. Rises.	October, 1931. Sets.	MOONRISE. Sept., 1931. Rises.	MOONRISE. Oct., 1931. Rises.
1	6.10	5.34	5.36	5.48	p.m. 9.7	p.m. 9.49
2	6.9	5.34	5.35	5.48	10.2	10.47
3	6.8	5.35	5.34	5.49	10.58	11.43
4	6.7	5.35	5.33	5.50	11.56	...
5	6.6	5.36	5.32	5.50	...	a.m. 12.39
6	6.5	5.36	5.31	5.51	a.m. 12.54	1.39
7	6.4	5.37	5.29	5.51	1.53	2.25
8	6.3	5.37	5.28	5.52	2.50	3.7
9	6.2	5.38	5.27	5.52	3.45	3.44
10	6.0	5.38	5.26	5.53	4.32	4.20
11	5.59	5.39	5.25	5.53	5.14	4.55
12	5.58	5.39	5.24	5.54	5.50	5.30
13	5.56	5.40	5.23	5.54	6.26	6.8
14	5.55	5.40	5.22	5.55	7.2	6.50
15	5.54	5.41	5.21	5.55	7.40	7.40
16	5.53	5.41	5.20	5.56	8.16	8.37
17	5.52	5.42	5.19	5.56	9.1	9.36
18	5.51	5.42	5.18	5.57	9.52	10.37
19	5.50	5.43	5.17	5.58	10.49	11.35
20	5.48	5.43	5.16	5.58	11.46	p.m. 12.33
21	5.47	5.43	5.15	5.59	p.m. 12.43	1.29
22	5.46	5.43	5.14	5.59	1.41	2.21
23	5.45	5.44	5.13	6.0	2.41	3.16
24	5.44	5.44	5.12	6.1	3.35	4.5
25	5.43	5.45	5.12	6.1	4.28	4.59
26	5.42	5.45	5.11	6.2	5.20	5.51
27	5.40	5.46	5.10	6.3	6.11	6.46
28	5.39	5.46	5.9	6.3	7.1	7.46
29	5.38	5.47	5.8	6.4	7.56	8.40
30	5.37	5.47	5.7	6.5	8.51	9.38
31	...	...	5.6	6.6		

Phases of the Moon, Occultations, &c.

5 Sept.	☽	Last Quarter	5 21 p.m.
12 „	●	New Moon	2 26 p.m.
19 „	☾	First Quarter	6 37 a.m.
27 „	○	Full Moon	5 44 a.m.

Perigee, 13th September, 3.24 a.m.
Apogee, 27th September, 12.42 p.m.

The curious coincidence of Mercury and Neptune being in conjunction with the Moon at the same hour on the 11th will be unobservable in Queensland.

Though a partial eclipse of the Sun will occur on the 12th, it will be invisible in Australia and observable only in high latitudes of North America and Asia.

At 5 o'clock in the afternoon of the 17th Mercury will be passing Neptune, but too much in the glare of the Sun to be perceptable.

On the 21st Mercury will be at its greatest distance, 18 degrees on the west side of the Sun, and will rise 49 minutes before it.

On the 24th the Sun will be passing the Equator from north to south and the equinox will occur.

About 4 o'clock in the morning of the 27th when the Moon is getting down towards the western horizon, it will be entering into the shadow of the Earth and become totally eclipsed two hours later.

Mercury will rise 7 minutes after the Sun and set 37 minutes after it on the 1st; on the 15th it will rise 49 minutes and set 51 minutes before the Sun.

Venus will be too near the Sun on the 1st and 15th to be visible.

Mars will rise at 8.9 a.m. and set at 8.43 p.m. on the 1st; on the 15th it will rise at 7.38 a.m. and set at 8.27 p.m.

Jupiter will rise at 4.43 a.m. and set at 3.27 p.m. on the 1st, on the 15th it will rise at 3.56 a.m. and set at 2.43 p.m.

Saturn will rise at 1.39 p.m. and set at 3.20 a.m. on the 1st; on the 15th it will rise at 12.38 p.m. and set at 2.21 a.m.

The Southern Cross will be at position II. at 6 p.m. on the 1st and at position III. at 8 p.m. when it will be horizontal and at its greatest distance, 30 degrees west of the celestial pole. It will disappear at Cairns about 10.15 p.m. on the 1st and reappear only when it reaches position VIII. (as on a clock face) about 6.15 a.m. At Warwick it will disappear a little before midnight and reappear about 4 a.m.

5 Oct.	☽	Last Quarter	6 15 a.m.
11 „	●	New Moon	11 6 p.m.
20 „	☾	First Quarter	7 20 p.m.
26 „	○	Full Moon	11 34 p.m.

Perigee, 11th October, 2.30 p.m.
Apogee, 24th October, 2.54 p.m.

On the 11th of October the Sun will be partially eclipsed, but visible only in South America and some islands and a portion of the Antarctic regions. On the same day Uranus will be in opposition to the Sun—that is in the west when the Sun is in the east, and in east when the Sun is west.

A daylight view of Venus and the Moon will be obviated by their nearness to the Sun.

On the 18th October Mercury will be in superior conjunction with the Sun—that is, it will be on the farthest side of its orbit, and about 35 million miles beyond it, and would be apparently within half a degree of its surface if visible.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/- including postage

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXVI. 1 OCTOBER, 1931. PART 4.

Event and Comment.

Investigation of Stock Diseases.

QUEENSLAND is one of the healthiest stock-raising countries in the world, and as far as the inculcation of sound principles of animal husbandry and appropriate legislation can be applied, every effort is being made to keep it so. New problems, however, arise from time to time, and with the object of providing additional means for their solution a Bill is now before Parliament. On its initiation in committee, the Minister for Agriculture and Stock, Mr. Harry F. Walker, explained that its purpose is simply to provide for the imposition of a small levy—1s. for every 100 head of horses and cattle—the amount so raised to be applied to the investigation of stock diseases all over Queensland. The work will be under the control of the Council for Scientific and Industrial Research, and the Townsville Stock Experiment Station will be the base of operations.

Stockowners will in future only pay one assessment, and the division of the fund will be proportioned appropriately. They have already expressed their approval of the proposal, knowing the practical benefits that must accrue. It is just another avenue for scientific investigation as applied to rural industry, and of which the economic value is becoming appreciated more widely. While the Council will direct and control investigations, the Department of Agriculture and Stock reserves the right to make use of the services of the station staff.

The Townsville station was selected because of its position in an important centre of our Northern cattle country, and of the necessity of having a well-equipped and accessible laboratory. Liaison will be maintained through the field officers of the Department.

Manufacture of Margarine.

TWO main purposes are sought in the measure now before Parliament to amend "*The Margarine Act of* 1910," namely, to protect the butter industry by ensuring the sale of the substitute on its merits alone, and to protect the purchaser of margarine. Briefly, it is aimed to protect Queensland butter from unfair competition on its own market from a more or less palatable substitute imported from other States. The Minister, Mr. Harry F. Walker, in the course of a notable second reading speech on the measure, reminded the Assembly of the great importance of the dairying industry to Queensland. It means a very large increase of new wealth every year to the State, besides being helpful to other industries. It has been the means of settling large tracts of our coastal and tableland country. It is one of the best land-settling agencies we have, the average area in many districts being round about 160 acres. There are no finer types of settlers than those engaged in the dairying industry. Approximately £35,000,000 are invested in dairying in the State, and its annual value is about £8,000,000. Production of butter alone last year totalled 92,894,213 lb. The value of the exportable surplus was £3,326,099. The national value of the industry is reflected generally in our commerce and trade statistics. Large cities like Toowoomba, Gympie, Maryborough, Bundaberg, and Rockhampton owe much of their prosperity to the success of the dairy farmer.

The Menace of Margarine.

DEALING with the menace of margarine, the Minister added that butter and the name "butter" are the goodwill of the manufacturers of that commodity, and the rights of the dairy farmer to that goodwill should be preserved by law. Those who have helped in the development of the industry are proud of their work. The butter factories of Queensland are among the most modern manufacturing plants of their kind. Owned and operated by producers through their farmer directorates they have won a great name for their product, both at home and abroad. Queensland butter has secured the highest awards in open competition in the United Kingdom and elsewhere. Why then, he asked, should an industry, the economic value of which was of such importance to the State, be allowed to remain subject to insecurity through the competition of a much less nutritious substitute?

The wholesale price, continued Mr. Walker, of margarine containing a butter blend imported into Queensland is 10d. a lb., and the retail price 1s. to 1s. 1d. The materials used included, in recent importations, beef fat and vegetable oils, such as cocoanut oil, cotton seed oil, and peanut oil. Last year the Cotton Board sold over 240,000 gallons of cotton seed oil, of which 200,000 gallons were purchased by Southern margarine manufacturers. The Bill would not affect those sales. The margarine makers would be at liberty to use those by-products; but their imitation of butter would not be permitted.

Interesting Analyses.

REGARDING the relative analyses of different brands of margarine as compared with butter, although it is almost impossible to ascertain the difference between one fat and another on the basis of analyses, Mr. Walker submitted an interesting series of analytical tables. Typical Queensland butter on analysis showed the following content:—Butter fat, 83.48 per cent.; moisture, 14.71; salt, 1.22; casein, .59; totalling 100.00 per cent.

An analysis of a typical margarine used for cake and pastry making gave the following result:—Colour, pale yellow; aroma, clean fat; flavour, salty tallow; consistency, homogeneous; melting point, 38 deg. centigrade; moisture, 12.5 per cent.; fat, 84.0; casein, .5; salt, 3.0; totalling 100.0 per cent. Artificial colour, nil; boric acid, nil; starch, present; sesame oil, nil; cotton seed oil, nil; butter fat, nil; skim milk, present.

While an analysis of a sample of margarine containing butter, and which could easily pass as butter, was made up of—Moisture, 10.5 per cent.; common salt, 1.5; casein, 1.1; fat, 86.9; totalling 100.0 per cent. Butter fat present, 10.0 per cent. melting point of fat, 21 deg. centigrade; starch, present; cotton seed oil, nil; boric acid, nil; sesame oil, nil; added colour, nil; natural colour, pale yellow; appearance, aroma, and flavour, like butter.

Those comparisons, however, do not give very much information. The analyses do not disclose the quantity of butter compounded with other substances and sold as butter, or as a thinly disguised butter substitute. Mr. Walker distinguished between the makers of margarine as such, and the blenders of butter with margarine. Until lately the latter had made no attempt to exploit the Queensland market, because of an impression that margarine containing butter was banned. A weakness in the principal Act was discovered, however, and consequently a commencement has been made to market here a margarine containing as high as 10 per cent. of butter.

Vitamin Values.

MR. WALKER, continuing, referred to the vitamin value of the two products. Butter contains necessary vitamins, while vegetable oil substitutes are almost entirely devoid of them. The comparatively small quantity of butter added does not improve appreciably the vitamin content of margarine. The ease with which margarine can be substituted for butter is causing concern, not only in Queensland and Australia generally, but in all countries of the world. Canada prohibits the manufacture or importation of margarine. New Zealand bans the use of butter or milk in the manufacture of margarine, only other animal or vegetable fats being permitted. South Africa permits the manufacture of margarine for culinary purposes only. The United States of America has a 10 per cent. tax on margarine, equal to 5d. a lb. New South Wales limits its butter-fat content to 10 per cent., and Western Australia to 5 per cent. The 1927 conference of Ministers for Agriculture recommended that the use of all milk products should be prohibited in the manufacture of margarine, and that existing legislation should be altered to give effect to this where necessary. The Queensland Act already met the terms of that resolution, and the amendments proposed in the Bill will merely remove anomalies. There is no new or vital principle involved. Other States are enacting similar measures, and the protective legislation will be welcomed by dairy farmers throughout the Commonwealth.

Protecting Honey Producers.

HONEY production is as yet a minor factor in our rural economy, but there are evidences that it will one day expand into an industry of major importance. There is unlimited scope for its development in Queensland. In order to protect and regulate the industry a Bill, introduced by the Minister for Agriculture and Stock, Mr. Harry F. Walker, is now before Parliament. Disease prevention is one of the main purposes of the measure, while other important points in the practice of apiculture will be subject to common sense regulation. In the course of his second reading speech, Mr. Walker gave some very interesting facts on the industry in its present stage of development, and forecast a profitable future for it in this State. There are at present about 13,000 productive bee hives in Queensland. The 1929 figures were 12,810 hives, from which 714,068 lb. of honey were extracted, an average of 56 lb. a hive. At 4d. or 5d. a lb., the present price of high grade honey, the possibilities of apiculture as a profitable farm sideline can be estimated easily. In the same year 10,739 lb. of beeswax were also produced. The output in Queensland is pooled under the control of the Honey Board which has already done particularly good work, in spite of the limited home demand and an export trade affected adversely by the prevailing economic conditions. Our apiaries are, fortunately, free from disease and the new measure is designed to keep them so, as well as to provide regulatory services similar to those given under existing laws relating to stock and vegetable life. It will apply to producing districts only, and there is no intention of interfering with people who keep bees for their own domestic requirements. On the other hand, everything possible will be done to expand the industry on sound, economic lines. One important provision is the recognition of the right of every beekeeper to a particular area free from encroachment. Selling will be restricted to honey produced from registered apiaries, and in this way the occurrence and dissemination of disease will be guarded against. With the same object, imported honey will be subjected to rigid inspection. Though wide powers will be conferred under the proposed law, it is understood that none of the provisions of the measure will be applied unless there is a necessity for its imposition. The measure has the full approval of those engaged in the industry, whose practical knowledge has been drawn on in its construction.

QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director of Sugar Experiment Stations.

PART XIX.

(d) The Employment of Coloured Labour.

ALTHOUGH the introduction and final deportation of kanaka or Polynesian labour in the sugar industry has been mentioned before in this history, it is felt desirable to devote another section to the subject for the reason that such labour played so large a part in the earlier stages of the industry, and was the subject of so much bitter recrimination and feeling from time to time. In his history of Queensland politics during sixty years (1859 to 1919), Mr. C. A. Bernays, Clerk of the Parliament of Queensland, deals with Pacific Island immigration at some length, and I have his permission to make some extracts from his interesting volume as follows:—

Pacific Island Immigration.

"August, 1863, nearly four years after the establishment of responsible government, marks the beginning of an experiment in this State which, all things considered, it might have been well had Queensland never made. It was at that date that Captain 'Bobby' Towns landed from the schooner 'Don Juan' the first consignment of the soft-eyed, soft-spoken kanaka, who played so large a part in subsequent years in the development of our great sugar industry. Originally imported here for the purpose of cotton cultivation in the Logan district, it was not long before Captain the Hon. Louis Hope, M.L.C., followed suit, and applied this class of labour to sugar-cane cultivation in the same district; and from this small beginning the practice of indenting Polynesian labour grew into a vast and flourishing industry until the sugar lands of the North practically produced their crops wholly by its aid. Perhaps, to be strictly accurate, it would be more correct to use the word 'Melanesian,' for the dark-skinned islanders who voluntarily came here, or who were brought here under various pretexts, hailed more exclusively from Melanesia than from Polynesia. Nevertheless, they were always known in Queensland as 'Polynesians,' and so they must be termed in this necessarily brief reference to the history of kanaka labour in Queensland. Who could have believed that the advent of this, perhaps the least objectionable class of black labour, would in time to come have led, as it undoubtedly did, to the division of political parties, to bitter political strife, to acute personal differences among our leading politicians, to numerous social evils of varying kinds, and in the ultimate to shocking tragedy—murder, rapine, kidnapping, and all the violence attendant upon buccaneering in its very worst forms. So large a part did this trade play in legislation and administration extending over a long series of years, that the subject could by no means be overlooked when relating the political history of the State.

"Evil as the whole trade was, blighting as it ultimately proved upon our social and political life, yet the curious fact remains that the kanaka, *per se*, was, as a rule, a peaceable, law-abiding, kindly disposed savage, wonderfully responsive to any act of benevolence, suited to the work for which he was imported, moderately industrious, astonishingly faithful to those who gained his confidence, and with no particular

Plate 98.—Kanakas Cutting Cane at Bingera Prior to Federation.

ambitions in regard to intermarriage with the white race. That was the early kanaka; his more modern prototype was, very largely under the influence of 'civilisation,' a pronounced blackguard—truculent, addicted to gambling, and frequently to drink—until in some of our Northern coastal towns he was becoming so great a social menace that, the advent of the Federation under whose laws he was unceremoniously bundled off home was, if for no other reason, an undisguised blessing.''

. . . . . .

''Locally, the importation of islanders into Queensland was governed under the 1868 law right up to 1880, when McIlwraith, having come into office for the first time, passed in the latter year a law which repealed the Act of 1868, re-enacted a number of its provisions with important alterations, and made the departure of appointing 'Government agents' to accompany each recruiting vessel to the islands. It may be said here that the Polynesian Labourers Act Amendment Bills introduced by Miles and Douglas in 1877 and 1878 respectively, had only reached their second reading stage, and in the meantime there had been continuous agitations either for repression or regulation of the traffic. In those years, Griffith, who afterwards took so prominent a part in the crusade against the trade and black labour employers, was a member of the Douglas Ministry as Attorney-General. Prior to the introduction of the above-mentioned Bills by Miles and Douglas there had been a Select Committee appointed by the Legislative Assembly in 1876 to inquire into ' the general question of Polynesian Labour.' In the light of the report of that Select Committee it is difficult indeed to give credence to much that has been said and written regarding this trade in black labour. After the examination of eighty-four agents' log-books the Committee concluded that 'the evidence has been singularly corroborative of the willingness of the islanders to come to the Colony, and of the absence of anything to warrant the assumption that they have been exchanged for trade, or otherwise improperly obtained,' and that while in Queensland their treatment had been 'humane and kind.' Before that Select Committee there was called as a witness a man who rightly or wrongly has been described as 'the Herald of White Australia.' William Brookes, at different periods a member of both the Legislative Assembly and Legislative Council, was a man who allowed his hatred of the trade to become a monomania. Practically he was the spokesman in Queensland of the Island Missionary interest, ever at war with the recruiter; and while no doubt he served a very useful purpose in constantly keeping in the limelight some of the more important abuses which admittedly attached to the business of recruiting, yet it is to be feared that he became somewhat bigoted on the subject, and was not able to take the more deliberate and judicial view of matters so necessary in the consideration of a question of State policy. He was an earnest and sincere man who allowed his extravagances of language to outrun his discretion, and no better example of that can be given than the language he used before the 1876 Committee when he said:—

> ''If we were told that husbands were separated from wives, thousands of children left without their natural protectors, homes desolated, villages ransacked and burned; drunkenness, fraud, and every dishonest artifice employed in order to procure these men who were to add so immensely to our comfort—we heard all this as if it were an idle romancing tale told by sentimental philanthropists. So it came to pass that citizens who were

> religious men, officers of churches, nay, even ministers of religion, saw no shame in availing themselves of the labour of poor, helpless savages who had been inveigled from their native homes, or in many, perhaps in most instances, who had been sold at the islands by their chiefs, and bought by white men, and bought and sold a second time at our whaves in Brisbane, Maryborough, Rockhampton, and Mackay."

"To use Brookes's own works, that indeed was 'idle romancing.' There were evils and to spare in the earlier days, but they had no official encouragement, and were suppressed with a stern hand in due time."

. . . . . .

"But a very much more important Act relating to Pacific Island labour was passed by Griffith in November, 1885. The eleventh and last section of this Act provided:—

> "After the thirty-first day of December, one thousand eight hundred and ninety, no license to introduce islanders shall be granted."

. . . . . .

"There was naturally bitter controversy over the proposed abolition, but it had been definitely agreed upon as a part of the State policy, and it was futile to try to resist the great political sweep of the country which Griffith had made at so recent a date.

"Who could have foretold, even with intimate knowledge of the great fighting qualities of the planter class, that this momentous decision would, within a few short years, be reversed? The importation of kanakas had to cease in December, 1890, but the islanders brought in up to that date would be on a three-years engagement, and thus eight full years were given in which those interested in the sugar industry could make arrangements for a suitable substitute.

. . . . . .

"The next move in the history of this troublesome question came in 1892. Two Governments, led by McIlwraith and Morehead respectively, had intervened between June, 1888, and August, 1890, at which latter date Griffith again came into power in combination with this one-time political foe McIlwraith. Many things had happened between those dates; many influences had been at work, and in April, 1892, Griffith came down to Parliament with and passed a proposal to repeal the provisions of the 1885 Act putting an end to the importation of Pacific Islanders.

"If one were asked to say how a man of Griffith's pronounced opinions, and whose political life's work had consisted largely of the advocacy of a white Queensland, committed a volte face of this description, it would be hard to give a true answer. When one looks back and thinks of how he attained the very pinnacle of his political fame largely by means of the high stand he took in his effort to prevent the good name of Queensland being besmirched by the dirty, sordid surroundings of a trade in black human skins, one wonders what malign influences were brought to bear to make so great a man recant such great ideals after spending the best years of his political life in cleansing an Augean stable.

Plate 99.—Kanakas in the Field at Bundaberg in the Old Days.

"No wonder that between the years 1892 and 1901 Parliament preserved an ominous silence in regard to the question of Polynesian labour. In had hurt itself by its astounding inconsistency and want of continuity of purpose, and when the first Commonwealth Government came into power and passed in 1901 the Act which gave significance to the white kangaroo which subsequently appeared upon our postage stamps; when the island nigger was unceremoniously bundled out of Queensland, exemption being given to those who were exempted under section 11 of the Queensland Act, 47 Vic. No. 12, on the ground of continuous residence for not less than five years before the first day of September, 1884, there was no very profound regret that from Queensland at least had been removed for ever a fertile source of political contention and a not too beauteous adornment of our social structure."

Some forty-five years ago Cairns was, to all accounts, an exciting place to live in; live alligators were reported to often promenade the streets after nightfall, the pubs were lively, and even the kanakas afforded sport according to the old newspapers, for instance:—

> "A novel and exciting competition took place at Hambledon Plantation, Cairns, on a Sunday, for a wager of £30 a side. Twenty kanakas from Loridan's were opposed to the same number from Swallow's, for eight hours' work in the field. The match was won by Swallow's kanakas by 15 points, the cane being cut cleaner and neater than by their opponents. The local churches were empty owing to this counter attraction. I wonder on which side the parsons bet."

One very pious planter used to conduct a mission to his kanaka employees, and in his sermons combined moral precepts with an eye to the main chance. For instance, in inculcating the necessity of obedience to masters and of walking in the straight and narrow way, he would impress upon them that while working in the cane they should not be idle in the big cane because they were hidden. "Remember, boys," he would earnestly say, "God can see you in the big cane just as well as he can see you in the little cane; therefore, work hard wherever you may be."

In the reminiscences of Nehemiah Bartley, being memories of fifty years of Australia and Polynesia, the following reference is made to Kanaka Labour in Queensland:—

"Hundreds of men were easily persuaded to come to Queensland for a 3-year or 40-moon term, for 10s. a month, and a guaranteed stomachful all the year round; and as the enterprising agents who chartered the schooners could land men for about £3 a head, and as they charged £12 per head bonus to the settlers who engaged them, and, as the schooners could make several trips a year and carried over 100 niggers each time, you can imagine there was money in the business; for a settler or planter could well afford to pay a bonus of £12 in order to engage an islander secured for 3 years at £6 a year, in place of having to give a white man £40 a year to do sugar-cane cutting; the food being the same nearly in both cases as to cost, the black man's being more plentiful but coarser and cheaper. These islanders thus set a lot of white labour free to do other and less manual work. When their three years have expired and they get their wages, they buy muskets, powder and ball, so that when they get home to their islands again they may be able to resist the tyranny of their chiefs, who are

apt to make slaves of them if unarmed. It is strange to note the difference between them and our own Australian blacks. The latter are squalid and have no love of finery, but the South Sea Islanders, when their time is expired, become like the old by-gone dandy slaves in America, with pink silk ties, black silk hats, and a red hybiscus stuck either in the ear or the button-hole. These savages eat inordinately when they come to Queensland; some of them could eat a 3-lb. loaf and a shoulder of mutton, if procurable, at one meal. Thus they got into a gross habit of body and if they happen to catch cold, which is frequently the case in a change from an island to a continental climate, it takes a very heavy hold on them, and though the Government provide splendid hospitals for them and have strict regulations as to medical attendance, the islanders, unused to sickness and over-feeding at home, despair of life at once, and die in a ratio far exceeding the white man's mortality. Some of them at first are glad to get a lump of stale bread and a bowl of weak tea, but a little later on, if they have taken a position outside sugar-growing, they want nothing but new bread, fresh butter, eggs, and strong tea."

An interesting side-light on the behaviour of kanakas in Bundaberg in the 'eighties appears in the evidence of the Police Magistrate of that city when he was before the 1889 Commission on the Sugar Industry. He said "the 'boys' frequently got drunk on liquor supplied in shops kept by Chinamen, especially in some of the fruit shops. They got drunk there and frequently meet men of other tribes; then often there is a row."

He suggested that "special constables should be picked from the better classes of long-time kanaka boys. The kanakas chiefly come into town on Saturday nights; he had seen at least from 200 to 300. They generally congregated about a Chinaman's house at the lower end of Bourbong street. There is no doubt whatever that they are encouraged in gambling by the Chinamen, and that they do gamble. There appears to be growing amongst them rooted objections to putting their money into Government Savings Banks, and they actually leave it with these "pimps" at these shops and allow them to make use of it as they like. One man was taken into custody not long ago for robbing a kanaka of £20. The case broke down because the kanaka had told him, "You take money and you pay me back by-um-by"; and these kanakas prefer Chinamen because they suppose they will give them a better rate of interest. I knew one Chinaman who told me himself that "his wife had stolen a box from him containing £60 belonging to these black boys. It is terrible the large sums of money these Chinamen have sometimes in their hands."

The diseases the kanaka suffered chiefly from were in the chest, such as consumption, pneumonia, and pleurisy, and these diseases were the primary cause of death. Europeans on the other hand in the early days in the Northern cane field suffered from malaria fever which, however, diminished as years went by. One doctor said that much sickness amongst the kanakas in the early days was caused through imperfect clothing and indiscriminate bathing at all hours of the morning and night. Whenever the kanaka finished his work at night they threw their clothes off and spent the coldest part of the evening without clothes; then they drunk polluted water very often, which gave them dysentry and diarrhœa. They were also very subject to influenza.

The "boys" occasionally made complaint of ill treatment and sometimes these complaints were groundless, at other times they were justified. They were generally investigated by the Polynesian Inspector for the district who took action when he considered same necessary.

Giving evidence before the 1889 Royal Commission already referred to, the Polynesian Inspector at Mackay said that in February of that year there were about 2,155 kanakas in Mackay. The health of these was not bad. About a quarter of them went to the hospital every year and about 5 to 6 per cent. of them died mostly from fever. Five had been murdered since he had been in Mackay. The "hospitals" on the plantations for kanakas were not in charge of qualified persons and they had some rather rough "doctors." Of course, there were many cases where only a dose of oil was needed, but there were some dispensers he would not care to trust very much.

At Bundaberg the Polynesian Inspector said that in February, 1889, 2,600 kanakas were employed. He had not heard of many cases of ill-treatment. The general health of the "boys" was pretty good, but they were rather subject to pneumonia and tuberculosis. The mortality was from fifty to seventy per annum. There was a kanaka ward at the General Hospital, and any serious cases were sent in there from the plantations. On all the larger estates there were dispensers to administer medicines; on the small ones the employer did it himself. The dispensers were practical men, but they were not qualified. The kanaka, as a rule, was respectful, and he had never heard of any of them behaving improperly to ladies on the street. There were some kanaka haunts in Bundaberg where liquor was supplied and he would like to see these put down. After they had performed their three-years' agreement 50 per cent. returned to their homes, 25 per cent. go back to their original employer, and 25 per cent. go to other employers. A large proportion professed christianity and attended Sunday schools and had services there. There were three missions in Bundaberg to kanakas.

At one plantation in the North, belonging to a well-known company, the unfortunate kanakas were only allowed cold water and sweet potatoes for dinner. It is not surprising to find that the bulk of the kanaka patients in the district hospitals came from that plantation. The authorities investigated the matter and the kanakas were supplied with the proper quantities of bread, meat, potatoes, and boiled water.

"The Box" or "Bokus," as the kanaka called it, has been referred to before in this history. The following reference to one of these articles appeared recently:—

"The old red deal kanaka trade-box, so profitable to traders, was the cause of much interest on the part of custom officials responsible for only the correct trade being allowed to pass, rifles being strictly taboo. On one occasion when the boxes were being examined prior to being placed on the old-time labour schooners, used for both recruiting and deportation purposes, the box in question looked most innocent, the top layer of contents consisting of bibles. However, suspicion was aroused, and lack of depth caused a more careful examination, and a false bottom was found to contain a couple of rifles reposing therein. Another episode occurred when a rather stiff-walking and fully skirted "Mary" was prodded, and two rifles were located strapped to the inner sides of the lady's legs."

The dispensers at the "kanaka hospitals" on the plantations were often of a rough and ready type. I remember at one plantation I was on, the regular dispenser was absent for a day when his offsider, a good-meaning fellow, but very ignorant, was much exercised in his mind as to whether an enema should be used on a sick kanaka. He consulted me on the point by asking did I think he ought to give a "Hemu" to Jacky who seemed very sick. I declined to advise, so whether Jacky got his "Hemu" or not remained a mystery. When the town doctors used to come out to inspect the sick boys, those who were not in bed were lined up against a wall. Now, no matter what was wrong, nine out of ten of the boys would say "fever" when asked what was the matter. One doctor had a quick way of finding out if this was really so. He would stick his clinical thermometer in the first boy's mouth, read it, and shake the mercury down, wipe it on his handkerchief, and stick it into the next mouth, and so on. Those with a temperature were relegated to bed, those with none were given a hearty curse and sent to work.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following entomological hints for October, 1931, from Mr. Edmund Jarvis, Entomologist, Meringa:—

Object of Monthly Hints.

The publication of this series of entomological notes was first started about eight years ago (1923) with the object of inducing growers to keep a lookout for the occurrence during different months of the year of our primary insect pests of cane. I would again stress the advisability of more co-operation between farmer and entomologist. Concerted action taken at the right time might go far towards minimising injuries caused by such pests as the weevil-borer, army worms, grass-hoppers, &c., and would not interfere materially with daily farming activities. Now is the time to prepare for fighting those leaf-eating insects which may chance to appear later on during early summer months. Equipment for such work costs very little, consisting merely in a good spray-pump and a few chemicals for making poison baits or arsenical sprays.

Those growers intending to fumigate their cane against grub attacks should get into touch with the Secretary of the Cairns Cane Growers' Association, with a view to placing their orders for soil-fumigants as soon as possible.

The Value of Soil-Fumigants.

One hears much talk regarding the cost of fumigants and their being too expensive for use against cane-grubs, &c. Such opinions, however, usually come from farmers who have not yet given them a trial, those who have done so being enthusiastic in their praise of this control method, which ensures them good plant and ratoon crops. Certainly, a grower who happens to suffer heavy losses each season cannot afford to disregard the merits of soil fumigation. Let us suppose, for instance, that he has a crop estimated to yield 25 tons per acre. Would he not be wise to sacrifice 5 of them in order to make certain of harvesting 20 tons? The 5 tons would fully pay for the expense of fumigating the acre, and not only ensure him a return of 20 tons, but also a crop of good ratoons for the following season.

On the other hand, by neglecting to fumigate he runs a risk of losing the entire 25 tons, and incurring the additional expense of replanting the acre, to say nothing about the cost of cane sets for planting this acre twice over and the loss of much valuable time.

Early Appearance of Grey-Backs in the Pupal Cells.

Existing conditions with regard to cane-beetle activities point to the possibility of an early emergence of grey-back cockchafers. One of these insects was ploughed up at Aloomba on 4th September, and additional specimens at Meringa three days later. These beetles were quite active, but would probably have remained two or three weeks longer in their pupal chambers before being ready to emerge normally and commence flying. During the years 1917 and 1918 grey-backs appeared on the wing on 20th and 25th October respectively, these being the only records of emergence for the last seventeen years. The specimens mentioned above as having already transformed to the adult or perfect condition were probably derived from eggs laid by the first emergence of beetles, which took place about the 8th December last. The grubs from these must have pupated towards the end of July; and in the event of the present dry conditions continuing throughout September and October, the beetles composing this early brood are likely to perish before being able to tunnel upwards to the surface.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received from Mr. E. Jarvis, Meringa, the following entomological advice to canegrowers:—

THE ARMY-WORM OR CATERPILLAR PLAGUE.

Owing to favourable weather conditions during July and August caterpillars of the noctuid moth *Cirphis unipuncta* Haw. have already commenced to attack young ratoon shoots in parts of the Cairns district. Quite possibly this pest may cause more trouble than usual throughout the coming months of September to November, and growers would do well to make provision for combating future outbreaks. The moths of *unipuncta* often lay their eggs on low-lying grass land, from which after consuming all the food near at hand the young caterpillars migrate in search of new pastures. In outbreaks of this kind they usually travel in army formation, and when chancing to assemble near headlands are likely to invade canefields. On the other hand, moths when flying over plantations of young plant or ratoon cane will frequently lay their eggs directly on the shoots among the heart-leaves, areas so infected varying in size from about 1 square chain to an acre or more. The caterpillars of this moth when derived from eggs deposited on the cane feed at night time hiding during the day among the central leaves, their whereabouts, however, being invariably betrayed by numerous pellets or powdery fragments of excreta scattered over the heart-leaves or on the soil close to stems of affected plants.

When cane is severely damaged, while caterpillars are found to be half grown ($\frac{5}{8}$ inch long), the leaves should be sprayed with lead arsenate, using $1\frac{1}{2}$ to 2 lb. in 50 gallons of water. The pump used should be fitted with an agitator in order that the arsenical content may be held in suspension, thus ensuring an even distribution of the poison over all foliage sprayed. Arsenical dusts are being used largely at the present time for fighting all sorts of leaf-eating insects or larvæ, and it is hoped that opportunities will offer this season of demonstrating to growers the effect of such treatment on army worms and grass caterpillars. Control measures are seldom necessary in cases where the infestation happens to be very local or where only a few dozen plants appear to be attacked per square chain.

Should the caterpillars even in severe infestations chance to be about $1\frac{1}{4}$ inches in length control measures are not needed. These larvæ are attacked by many species of parasites, and also by a virulent disease known as "wilt" which often destroys 90 per cent. or more of the caterpillars.

Owing to the combined activities of such enemies, the second and succeeding broods of this moth pest are usually rendered harmless, on account of the proportionate increase of its parasitic foes.

GUMMING DISEASE RISKS.

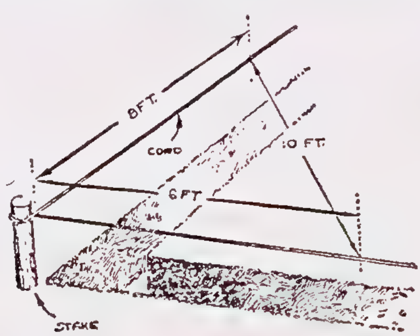
In response to a request from Bundaberg farmers, the Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received from the Pathologist (Mr. A. F. Bell) the following report, 9th September, 1931, on the question of planting sugar-cane immediately following the ploughing in of a crop affected with gumming disease:—

The planting of a variety susceptible to gumming disease immediately following the ploughing in of a diseased crop is a practice which must be condemned outright. However much care a farmer might take in the operation of ploughing in, a certain number of diseased volunteer stools are almost certain to grow out from the remains of the stools of the old crop. In the ordinary course of events these would be destroyed in a subsequent ploughing, but in the case of an immediate replant they grow up amid the stools of the new crop. It is well known that gumming disease is readily spread through scratches in the leaves during wet weather, and that this is, in fact, the main mode of spread in the field. Consequently diseased volunteer stools will rapidly infect the surrounding cane as soon as suitable wet weather conditions occur, and the whole field will become infected, although only perfectly healthy setts may have been used in the new planting.

On the other hand, if planting is delayed until it is certain that all volunteer stools have been destroyed, there is then no danger of the new crop becoming infected through the soil. All attempts to transmit the disease through the soil have failed, and in this connection mention should be made of an experiment carried out on a field scale in the Bundaberg district this year by Mr. N. L. Kelly. In December, 1930, stools and stubble of cane which had died from gumming disease were taken to an isolated field and ploughed in. The field was inspected at intervals to ensure that no volunteer stools survived, and in February-March the field was planted with disease-free setts of highly susceptible varieties. The resultant crop is perfectly healthy, and no symptoms of gumming disease have ever been seen.

SQUARING A BUILDING.

In laying out buildings, foundations, &c., it is very important that they be properly squared before any work is done. A steel square is far too small to be reliable as guide in work of this kind. This method consists entirely of measurements. A stout stake is driven into the ground at the spot selected as the master corner. The direction of the master side is than determined. The other sides are then squared from this side. A strong cord is drawn across the master side and to stakes at the other corners which are temporarily set.



Measure 6 feet along the master cord from the point where the cords cross, and mark this point on the cord. Now measure 8 feet down along the cord at the side. Move this cord in or out as required until the distance between these two points is exactly 10 feet, as indicated in the sketch. The cords are then at exactly a 90-degree angle. The other stakes are then driven firmly into the ground and the cord drawn tight from one to another. The cord is then used as a guide for digging the foundation trench, setting concrete forms, or building stonemason work walls.—"New Zealand Farmer."

ECONOMIC ENTOMOLOGY.*

By ROBERT VEITCH, B.Sc., F.E.S., Chief Entomologist.

THE earliest existing literature contains interesting and significant references to insects and their association with man and the plants and animals required for his sustenance.

Such literature clearly indicates that the agricultural pest of outstanding importance to the early civilisations of Egypt and Assyria was undoubtedly the locust. Plagues of locusts and their devastating effect on early agriculture are a subject of lamentation by the prophet Joel. Furthermore, as B. P. Uvarov has pointed out, "the most ancient monuments of human civilisation, such as those of Assyria and Egypt, offer some definite beginnings of locust literature." L. O. Howard, in his recently published "History of Applied Entomology," records the opinion that "The shifting of the prehistoric civilisations of Central America may have been influenced largely by the occasional devastations of migratory grasshoppers." It is thus evident that man in ancient times was only too well aware of the influence exercised by insects in his struggle for existence on the fruits of a primitive agriculture.

When we turn our attention to the field of medical entomology we find that the influence of insect-borne diseases was even more profound—e.g., it is generally believed that the decay of the ancient Greek civilisation was due to the prevalence of malaria, an insect-borne disease introduced to Greece by hordes of invaders from Persia. Again, the course of civilisation in the Middle Ages must have been radically influenced by a still more deadly insect-transmitted disease—namely, bubonic plague, devastating epidemics of which swept across Europe in these times. Our ancestors were, of course, quite ignorant of the association between such diseases as yellow fever, bubonic plague, typhus, and malaria on the one hand and insect vectors such as mosquitoes, fleas and lice on the other.

The Position in Australia To-day.

When we turn our attention from the state of affairs existing in these early historic times to present-day conditions in Australia, we find that the position is both interesting and serious in so far as losses from insect activities are concerned.

On first settling Australia the white man inherited a continent which gave him not a single plant of importance that could be grown for his sustenance, nor did it yield a single animal that could be domesticated with profit. Hence everything required to make Australia habitable for our race had to be introduced. With these early introductions many serious pests of plants and animals were unfortunately brought to our shores. One can hardly blame the pioneers who were struggling for a footing in a new continent. They simply did not realise the extent of the added burden they were placing on the shoulders of future generations of farmers. Food in quantity had to be produced for the new communities, and seeds, living plants, and cuttings were introduced without adequate precautions and in quantities which would now be regarded as much too large for safety. One cannot help regretting, however, the magnificent opportunity that

* Text of a wireless address from Station 4QG.

was lost. If the rigid quarantine associated with modern administration had been operative from the commencement of settlement in our continent, we would have enjoyed, for many years at least, a wonderful degree of freedom from a large number of the serious pests that burden our competitors, and we would have gained a very material advantage in lessened costs of production. There would, however, have been no complete immunity from losses, because quite a number of Australian insects feeding on native plants prior to the advent of European civilisation turned their attention to introduced economic species.

With respect to Queensland itself, the position is intensified by a number of factors advantageous to insects in the struggle between man on the one hand and insects on the other for the available food supply. Firstly, we have a tropical and semi-tropical climate in which the winter check on insect life is not nearly so severe as that existing in practically every other country settled by the white race. Secondly, many of the areas under cultivation are very small in extent and are frequently isolated from each other by large stretches of scrub or uncultivated land which serve as breeding grounds for many injurious insects. Thirdly, Queensland is growing an extremely wide range of crops, starting with deciduous fruits produced in the Stanthorpe district at an elevation of almost 3,000 feet above sea level and ending with the most tropical products of North Queensland. A combination of these and other factors has resulted in Queensland being faced with a very large number of extremely serious problems. It is very difficult to form anything like an accurate estimate of the total loss in primary production due to insect activities in this State. There is, however, little doubt that it runs into several millions annually, this estimate including the losses inflicted by insect attacks on animals as well as on economic plants.

The Campaign Against Insects.

The magnitude of the problem having been indicated, it is now incumbent on me to refer to the measures that are being taken to alleviate the position.

Quarantine.

The first and one of the most important measures is the enforcement of rigid quarantine. This is essential because many very serious pests have not yet reached Australia, and every effort is now being made to prevent their doing so. The bad old conditions of practically uncontrolled mass importations of seeds, cuttings, and living plants and animals have happily long since passed away, and efficient quarantine has taken their place.

Most economic entomologists consider it desirable that, so far as practicable, no seeds, living plants, or cuttings should be introduced from overseas without good reason for doing so. Such introductions should be made only when there is evidence to support the belief that better varieties are available elsewhere and that such improved varieties are required for the continued prosperity of the branch of agriculture concerned.

When such introductions have been decided on as essential, it is furthermore generally considered desirable to restrict the importation to a relatively small quantity of seed, cuttings, or living plants of the required species or variety. The reason for this is that small quantities

can be grown in restricted areas under close supervision, so that any associated pests which may have passed the quarantine inspection can be adequately and promptly dealt with by extermination. This attitude of restriction of importation to small quantities is sometimes disappointing to growers, who are naturally impatient to plant up large areas of the improved varieties. It must be recognised, however, that the welfare of future generations of primary producers has to be taken into consideration, and any immediate gain achieved by mass importations might quite probably be obtained only at the cost of imposing on farmers the burden of the control of an additional pest.

Even when only limited introductions are made for planting purposes, rigid inspection is carried out and fumigation or sterilisation by other methods is a normal procedure. There is thus an assurance that everything practicable is being done to eliminate the risk inevitably associated with plant introductions.

Advisory Work.

Having indicated the precautions necessary to ensure that there will be no additions to our list of imported pests, attention can now be directed to those that are already present in the State. With respect to these, effective control measures are available in many cases and advice is regularly given to a large number of inquirers seeking information regarding control. Such advice leads to a saving of crops that would otherwise be partially or wholly destroyed with consequent heavy losses to the growers.

Research Work.

While much valuable information can undoubtedly be given with respect to the control of many of our pests, it must be admitted that there are still a large number of destructive insects for which control measures are only moderately efficient or in some cases totally inadequate. This is only what is to be expected in a young country faced with a multiplicity of problems, and it is the existence of these unsolved problems in control that justifies the numerous research projects at present under way in Queensland. That progress is being made in such research work is evidenced by the fact that in recent months the control of two very important fruit pests has been placed on a wholly satisfactory basis, whereas in previous years growers were not in a position to fight them at all effectively. It is considered that in one case the yield of fruit will be increased as much as thirty per cent., always provided, of course, that the control measures now recommended are applied by the growers.

Summary.

In these brief remarks I have endeavoured to demonstrate the importance of economic entomology, particularly in a semi-tropical climate such as that possessed by Queensland. I can assure you that the quarantine, advisory, and research work discussed as the main features of the campaign against destructive insects are sound business propositions, and it is pleasing to know that they are more and more being recognised as such by the community as a whole and that entomology is no longer regarded as a more or less harmless pastime indulged in by a few abnormal individuals. Economic entomology is now accepted in advanced communities as an integral part of any efficient organisation associated with primary production and health protection.

SOFT ROT (WATER BLISTER) OF PINEAPPLES.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

FOR some years past there has been reported from Southern markets a storage rot of pineapples known to the trade as water blister. This trouble is at times responsible for considerable loss both directly and in the depressing effect its presence has on the market. No disease known as water blister was recorded as occurring in Queensland, and it was eventually arranged that the Queensland Department of Agriculture and Stock should co-operate with the Council for Scientific and Industrial Research in investigating the problem. It was agreed that the plantation aspect of the problem should be handled by the plant pathological staff of the Department of Agriculture and Stock while the Council for Scientific and Industrial Research made itself responsible for the Sydney and Canberra work. An investigation in the Sydney markets soon led to the identification of the trouble as being the common soft rot of pineapples due to the fungous parasite *Thielaviopsis paradoxa,* a disease which had been known by plant pathologists in Queensland under names other than water blister for some years.

Since the discovery of the cause of the disease a considerable amount of work has been done in connection with finding a preventive and also in determining the origin and manner of dissemination of the causal organism in the field. This work has now reached a stage when many interesting facts may be placed before growers.

Description.

Soft rot is rarely seen on the plantation except on discarded fruit left undestroyed. In the early stages there is externally little evidence of damage other than a slight darkening accompanied by a water-soaked appearance of the surface. However, the skin will be found to be in a soft, brittle condition and may be easily pressed in with the finger. Internally there appears a semi-circular area of decay in a soft watery condition and somewhat darker than normal. This area extends out from the original point of infection, which is usually found to be the broken stalk end or other injury (Plate 100). As the disease progresses the affected region may develop a sooty grey colour owing to the production of enormous numbers of dark fungous spores within the tissue. Eventually the whole fruit is reduced to a soft watery rotting mass with the characteristic thin brittle outer shell. A disease appearing in the plantations which is sometimes confused with soft rot is that known as yeasty rot. This, however, may easily be distinguished by the following characteristics. The shell of a yeasty fruit is tough and leathery and of a dark brown colour. Internally the affected region exhibits a definite yellow colour and is in a dried shrunken condition. The core is last affected, whereas in soft rot this becomes rapidly soft and shreaded. Owing to the fermentation and loss of water taking place, the yeasty fruit is distinctly light in weight.

Another manifestation in which the fungus *Thielaviopsis paradoxa* appears to growers is as the causal agent of butt or base rot. This consists of the rotting of the butts of suckers and slips shortly after planting, the base of the planting material being reduced to a soft black

Plate 100.

Upper figs.—Pineapple fruit affected with Soft Rot (Water Blister.)

Lower figs.—Infected pineapple top producing spores *Thielaviopsis paradoxa.*

shreaded condition (Plate 101). This trouble makes its appearance during warm, wet weather, more especially when the suckers have not been dried out prior to planting.

Important Points Bearing on Control.

Distribution.—Soft rot appears to be present throughout all the main pineapple-growing centres of Queensland. The disease is most prevalent during the warm and usually wet months of January to April, inclusive, when the main summer crop is being harvested. Experiments

Plate 101.—Base Rot of Pineapple Suckers.

with the temperature requirements of the fungus *T. paradoxa* show that its growth would be favoured by the warm summer weather, but would be retarded as cooler weather developed towards winter.

Point of Infection.—It was demonstrated after examining numbers of affected fruit in Sydney that in 75·5 per cent. of cases infection had taken place through the wound left by the breaking or cutting of the stalk. Various other surface injuries accounted for the other 24·5 per cent. affected. Observations in the plantation have shown that even

minute cracks in the fruitlet walls scarcely discernible to the naked eye are sufficient to allow the entrance of the fungus under favourable conditions.

Disinfectants.—For the past three years in conjunction with the Council for Scientific and Industrial Research attempts have been made to find a preparation which when applied to the fruit would prevent rotting taking place, the main attention being directed towards preventing infection through the stalk end. Fruit were treated in Queensland in many different ways and shipped to Sydney or Canberra, where they were examined for results. In all some 190 cases were treated in this way, the fruit being supplied through the courtesy of the Committee of Direction of Fruit Marketing.

It has now been shown that dipping the stalk in benzoic acid powder within five hours after cutting will prevent the development of soft rot through this point and thus reduce the amount of loss by 75 per cent. Boracic and salicylic acid were also found to be effective in this way, but their use is not desirable from the health point of view.

The best method of applying benzoic acid is as follows:—The fruit should preferably be cut from the plants with long stalks. The stalk is then cut a second time just prior to treatment, and the cut end is rubbed in benzoic acid powder, which can be conveniently placed in a saucer or some such vessel, and then packed. It has been found that the cost of treatment by this method is approximately twopence per case for materials. This cost may be considerably reduced if the benzoic acid is very carefully and intimately mixed with an inert substance such as kaolin. Fruit have been successfully treated by using a mixture of 1 part benzoic acid with as much as 4 parts of kaolin by weight.

Source of Infection.—Soft rot cannot develop without the presence of the spores of the causal fungus. The source of these spores is therefore important. Suckers, tops, leaves, and fruit left lying about the plantation and packing shed during the wet summer months are always liable to become infected with the causal organism of the disease, which produces in the tissue enormous numbers of dark-coloured spores (Plate 100). These spores become liberated into the soil and air and are blown to healthy fruit. Rot flies (Drosophilidæ) have been shown to be capable of carrying the disease from affected to healthy fruit, and rot beetles may also be a factor. That the fungous spores do exist in the air has been demonstrated in the following manner:—Small glass plates containing a culture material on which the Thielaviopsis fungus will grow have been exposed to the air for one or two minutes in sheds which were obviously not kept reasonably clean, and the fungus has later appeared growing on them. The organism has also been grown from the dust and earth on the floor of such packing sheds and from the soil in the plantation where suckers affected with butt rot have been taken out. So far the fungus has not been found in association with healthy living plants. The following example should force home in a striking manner the need for keeping the plantation and packing shed perfectly free from all pineapple refuse:—A grower obtained several thousand suckers for planting material, which were stored in a large shed. These, on account of wet weather, became badly affected with butt rot and were allowed to remain. The first picking of summer fruit were packed in another shed and harvested without loss. The next picking, being larger, was for convenience packed in the shed containing the heap of rotting

suckers. This consignment resulted in a total loss from soft rot. The fungus *T. paradoxa* was found by cultural methods to be present in abundance in the air and soil of the packing shed.

Control.

1. Practise strict sanitation in the plantation and the packing shed. All discarded suckers, tops, leaves, fruit, &c., should be gathered up and burnt or buried. This is perhaps the most important factor in the control of soft rot and may be the means of reducing the loss from this disease to an insignificant minimum.

If the packing shed has already become infected it should be thoroughly cleaned out and then sprayed with formalin solution of 5 to 10 per cent. strength.

2. All fruit should be carefully handled and packed to avoid bruising. Fruit damaged in any way should be discarded from long-distance consignment.

3. Fruit should be cut rather than broken off the stalk. It is an advantage to make a second cut just prior to packing with a knife which is wiped every now and then with a fungicide such as formalin or methylated spirits. This removes the spores which may have alighted on the previously exposed surface.

4. The cases and packing material must be free from contamination.

5. During the wetter summer months a preventive treatment of the fruit with benzoic acid may be advisable, although strict sanitary measures should obviate the need of this extra precaution in most cases. The following procedure is recommended:—Prior to packing, the cut end of the fruit stalk should be rubbed either in pure benzoic acid powder or in a mixture of benzoic acid and kaolin. The amount of kaolin should not exceed four times the weight of the benzoic acid, and should be very intimately mixed with it.

6. The form of Thielaviopsis injury affecting planting material and known as butt rot is usually effectively controlled by drying the plants well in the sun after trimming ready for planting. This may be conveniently done on a wooden or wire-netting tray raised off the ground.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

CABBAGE MOTH CONTROL BY NON-ARSENICAL SPRAYS.

By HUBERT JARVIS, Entomological Branch.

PROBABLY the most serious insect enemy that the cabbage-grower has to contend with in the Stanthorpe district is the cabbage moth (*Plutella maculipennis* Curt.).

This destructive little pest causes very serious damage to cabbages, and losses to the grower from this source have been exceptionally heavy during the last few years.

Although repeated treatments with arsenate of lead sprays and dusts have been generally resorted to, yet the control results obtained have been far from satisfactory, and it is evident that arsenate of lead, as generally recommended, is somewhat lacking in efficiency as a control for cabbage moth.

This is probably in some measure due to the impossibility of reaching every part of the cabbage with the spray or dust, and to its uselessness as a contact insecticide.

Doubling and even trebling the strength of the mixture has sometimes been resorted to, but this practice cannot be recommended as no better results are obtained, and, moreover, the excessive amount of arsenate of lead on the cabbages renders them dangerous to the consumer, more especially when cabbages are treated just prior to marketing, which is unfortunately often the case.

The experiments detailed in this report were carried out at Stanthorpe in the 1930-31 season with a view to obtaining a satisfactory control of this pest, with a spray of a non-poisonous composition, or one not likely to render the cabbage unfit for human consumption.

Experimental Plots.

The experimental plots were situated on high, level ground, and the drainage was all that could be desired. The nearest cabbages adjacent to the plots were about half a mile away. Each plot was approximately a quarter of an acre in area, and contained 816 plants, about three weeks planted, at the date of the first treatment.

One plot was treated with a proprietary spray known as katakilla, and the other with nicotine sulphate, soap, and arsenate of lead. Katakilla is a derris product. The spray mixtures were applied with a power-spraying outfit, having a pressure of 225 lb., driven by a gasoline engine rated at two-horse power. Katakilla was used at the strength recommended by the makers—i.e., 2 lb. to 40 gallons of water, and the nicotine sulphate at a strength of half a pint to 40 gallons of water, plus 2 lb. of soap and 1 lb. of arsenate of lead. Four treatments were given with each spray, every effort being made to thoroughly spray the plants, both on the upper and under surface of the leaves.

The quantities of material used at each spraying, the dates of application, and the cost of the materials are shown in Table I. Cost figures are based on the ruling local price of both katakilla and nicotine

sulphate, the former at 4s. per 2-lb. packet, and the latter at £2 18s. per 10-lb. tin. Soap is based on the local price of 5d. per lb., and arsenate of lead at 1s. 9d. per lb.

Seasonal Conditions and Insect Enemies.

Weather conditions throughout the growing period were unfavourable, being exceptionally dry and hot, and during November and December many cabbages wilted badly through lack of moisture. The moth at this time was especially active, as were also Rutherglen bug, *Oxycarenus* sp., and a small green jassid, the combined attack of these insects causing an additional setback to the plants. On the advent of rain, however, the plants were able to make good headway again, even some of those that had appeared almost worthless developing into marketable cabbages. Cabbage aphis was present in the plots, but caused little or no damage.

Mortality Tests.

In order to test the toxic value of the two sprays, a number of both the caterpillars and the cocoons were collected from each plot immediately after spraying and while still wet with the spray. These were kept under observation in breeding jars, and the results in Tables II. and III. show the superiority of katakilla as a contact spray; even the pupæ were killed within the cocoons. The cocoon is of course merely a light network of a very open structure, and it is evident that the spray was able to penetrate it. The number of pupæ killed by the nicotine and arsenate of lead spray was very small, being only 26·6 per cent., while 80 per cent. were destroyed by katakilla. The nicotine and arsenate of lead spray killed only 33·3 per cent. of the larvæ, whereas the larval mortality from katakilla was 87·5 per cent.

A number of the Rutherglen bugs were also collected from each plot, while wet with the spray, both adults and immature stages being represented. The results were very interesting, katakilla giving a 79·2 per cent. kill and the nicotine and arsenate of lead spray a 42·5 per cent. kill.

Seasonal Prevalence of the Moth.

All cabbage growers suffered serious loss during the season from the cabbage moth, everything being in favour of the pest, which was epidemic, and against normal cabbage growth. This is one of the pests which is consistently present in a greater or lesser degree each season, and although certain parasites are generally active, they apparently exercise only an inconsiderable degree of control.

White Oil Spray.

Although not thoroughly tested, it is worthy of mention that towards the end of the season about 400 cabbages were sprayed with a white oil preparation at a strength of one gallon of the oil to 80 of water, plus 2 lb. of arsenate of lead. At the time of spraying the cabbages were well hearted but badly attacked by the moth. The result of this spray was remarkable, the cabbages remaining cleaner than on either of the experimental plots. No dead larvæ could be found, and apparently the oil acted as a repellant. Damage to the cabbages ceased, nor were they later attacked. Experiments with this spray next season would certainly appear to be worth while.

Summary.

From the information tabulated it will be seen that both katakilla and the nicotine sulphate and arsenate of lead mixture used at the strength indicated gave a fairly satisfactory control of cabbage moth in an exceptionally bad season. The plants treated with katakilla were cleaner and better grown, and the toxic properties of this spray were superior to the nicotine sulphate and arsenate of lead spray.

The difference in price and quality of the cabbages from the respective plots was not recorded, but merely the number cut and marketed, and it will be realised that a cabbage may be marketable although of poor quality, but will not realise as good a price as a first quality cabbage.

The grower concerned was satisfied as to the superiority of the katakilla spray, it being repeatedly noted that practically every caterpillar hit by the spray perished, and this applied to even large noctuid caterpillars, a few of which were present on the plants.

Arsenate of lead, being only a stomach poison, appears to be the least satisfactory insecticide for cabbage moth control, and this, coupled with the danger to the consumer by its use in excessive quantities, is a strong argument for the use of non-arsenical sprays, which, in addition to a greater degree of efficiency, have the further recommendation of being safe from the point of view of the consumer.

TABLE I.

Time and Cost of Applications.

Date of Application.	Number of Plants Treated.	Material Used and Strength.	Quantity Used.	Quantity of Spray Fluid.	Cost.	Total Cost of Spray.
				Gallons.	s. d.	s. d.
			Plot No. 1.			
10th Dec., 1930 ..	816	Katakilla at 2lb. to 40 gallons	2 lb.	40	4 0	36 0
23rd Dec., 1930 ..	816		4 lb.	80	8 0	
10th Jan., 1931 ..	816		6 lb.	120	12 0	
9th Feb., 1931 ..	816		6 lb.	120	12 0	
			Plot No. 2.			
11th Dec., 1930 ..	816	Nicotine sulphate at ½ pint to 40 gallons, soap 2 lb. to 40 gallons, arsenate of lead powder 1 lb. to 40 gallons	Nicotine, 10 oz.; soap, 2lb.; arsenate, 1 lb.	40	6 2½	45 0
23rd Dec., 1930 ..	816		Nicotine, 20 oz.; soap, 4 lb.; arsenate, 2 lb.	80	12 5	
13th Jan., 1931 ..	816		Nicotine, 30 oz.; soap, 6 lb.; arsenate, 3 lb.	120	18 7½	
10th Feb., 1931 ..	816		Nicotine, 30 oz.; soap, 6 lb.; arsenate, 3 lb.	120	18 7½	

TABLE II.

MORTALITY TO CABBAGE MOTH LARVÆ OF KATAKILLA.

Date when Collected.	Number of Insects Collected.	Number Dead in 24 hours.	Per cent.
10th January, 1931	40	40	100
9th February, 1931	40	30	75
	80	70	87·5

MORTALITY TO CABBAGE MOTH LARVÆ OF NICOTINE, SOAP, AND ARSENATE.

10th January, 1931	38	16	42
9th February, 1931	40	10	25
	78	26	33·3

MORTALITY TO RUTHERGLEN BUG OF KATAKILLA.

10th January, 1931	50	46	92
9th February, 1931	46	30	65·2
	96	76	79·2

MORTALITY TO RUTHERGLEN BUG OF NICOTINE, SOAP, AND ARSENATE.

10th January, 1931	80	36	45
9th February, 1931	40	15	37·5
	120	51	42·5

TABLE III.

MORTALITY OF CABBAGE MOTH PUPARIA (KATAKILLA).

Date when Collected.	Number Collected.	Number Moths Emerged.	Number Died.	Per cent. Killed.
10th January, 1931	40	6	34	85
9th February, 1931	40	10	30	75
	80	16	64	80

MORTALITY OF CABBAGE MOTH PUPARIA (NICOTINE, SOAP, AND ARSENATE).

10th January, 1931	30	24	6	20
9th February, 1931	30	20	10	33·3
	60	44	16	26·6

TABLE IV.

PERCENTAGE OF SOUND AND UNSOUND CABBAGES FROM PLOTS.

Plot Number.	Treatment.	Number of Plants.	Number Marketed.	Per cent.	Number Unsound.	Per cent.
1	Katakilla ..	816	604	74	212	26
2	Nicotine, soap, and arsenate of lead.	816	553	67·7	263	32·3

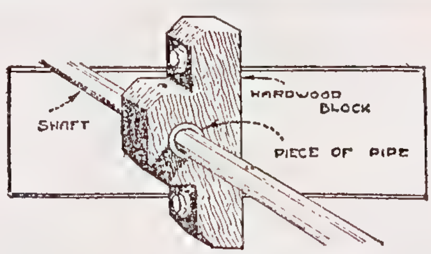
TABLE V.

RAINFALL TABLE DURING PERIOD OF EXPERIMENT.

1930.				1931.					
November.		December.		January.		February.		March.	
Date.	Points.	Date.	Points.	Date.	Points.	Date.	Points.	Date.	Points.
1	3	6	1	9	36	1	162	4	2
4	15	8	28	10	57	4	33	6	48
6	4	14	2	19	59	5	97	10	6
7	29	15	10	26	10	6	30	12	3
10	22	17	89	29	3	8	4	13	6
16	23	22	10			28	2	15	5
19	8	26	39					16	5
22	43							22	32
24	2							23	19
								24	45
								25	14
								26	1
								28	1
Nov.	149	Dec.	179	Jan.	165	Feb.	328	Mar.	187

LINE SHAFT BEARING.

By means of a line shaft it is possible to drive a number of different machines or tools from one source of power. Many farms are now provided with electricity, and in this case an electric motor can be used to turn the line shaft. However, if electricity is not available, a gasoline engine will serve the purpose just as well.



In installing a line shaft, good solid bearings must be used. A good way to make these bearings is to take a hardwood block two inches thick, four inches wide, and twelve inches long, and cut it out in the shape shown. A hole is then bored through the block that is large enough for a piece of pipe that fits over the shaft to be used. A short piece of this pipe is then driven into this hole. The bearing is attached to the walls by means of two lag screws or bolts placed through the top and bottom of the block in the position shown. An oil hole is then drilled through the wood and the metal pipe from the top. The bearings must be attached to the studding of the building to make them rigid.

SOME NOTES ON THE BIOLOGY OF QUEENSLAND SHEEP BLOWFLIES.

By F. H. S. ROBERTS, M.Sc., Entomological Branch.

BLOWFLIES are generally regarded as species of flies which blow or lay their eggs on carrion, so, in the ordinary course of nature, acting as scavengers, and helping in this way to get rid of offensive materials in a rapid and efficient manner. Some of the species, however, have developed the habit of utilising live flesh for this purpose. In the case of short-haired animals, such as cattle and horses, blowfly attack occurs only when wounds and abrasions are present to attract them; but in sheep, on the other hand, the soiling of the thick wool is in itself sufficient to attract the flies and induce "blowing." Wounds, of course, also play their part in the inducement of strike, the infestation of the flesh-cracks and bruises on the head of the ram caused through fighting, and of the tail of the lamb after marking, furnishing good examples.

The conditions predisposing sheep to blowfly attack are as yet imperfectly understood, but it is fairly evident that, before "blowing" will occur, the wool attracting the flies must have a certain degree of moistness. The crutch and pizzle wool, where fly attack is usually most general, is made attractive to the flies through soiling with exereta and urine. Wool made moist from dew and rain, and even from the saliva of the sheep when it has been biting at some irritation, may also be struck.

The Species of Blowflies Concerned.

In Australia nine species of blowflies are recorded as attacking sheep, but only eight of these are to be found in Queensland, *Calliphora australis* Boisd. being confined to Western Australia. These sheep blowflies belong to the super-family Muscoidea. *Sarcophaga froggatti* Taylor is a member of the sub-family Sarcophagidæ, or flesh flies, the majority of which breed in carrion, though some species infest excreta, and one is a useful parasite of grasshoppers. The Sarcophagidæ may be readily recognised by their striped thorax and checkered abdomen. *Sarcophaga froggatti* was originally obtained from wool-infesting maggots at Winton, but, as there is only one record of its attacking sheep, the species is not regarded as of much importance. A second species of sheep blowfly to be found in Queensland is known as *Peronia rostrata* R.D. This is a shining, dark-blue fly belonging to the family Anthomyidæ. Flies of this family also breed in excreta and decaying vegetable matter. Little is known of the biology of *Peronia rostrata*, but it appears to have been bred only from sheep on which "blowing" was well advanced.

The remaining species belong to the sub-family Calliphorinæ, family Muscidæ, a family of flies of widely divergent habits, including, besides blowflies, such species as the house fly, stable fly, and buffalo fly. The Calliphorinæ are to be found breeding only in flesh, and do not utilise excreta, as is sometimes thought. The six species of this sub-family attacking sheep in Queensland are *Lucilia sericata* Meig., *Calliphora auger* Fabr., *Calliphora stygia* Fabr., *Chrysomyia rufifacies* Macq., *Chrysomyia micropogon* Bigot, and *Microcalliphora varipes* Macq.

Lucilia sericata Meig.—The fly known under this name in Australia is apparently identical with the English greenbottle, which is the

commonest sheep blowfly in the British Isles. It also occurs in other parts of the world where strike in sheep is known. Just how and when it was introduced into Australia is unknown. *Lucilia sericata* is a comparatively slender and bristly fly (Plate 102, fig. 4) about four-tenths of an inch in length. There is a fair amount of variation in size, which appears dependent upon the amount of food consumed by the larva or maggot. The colour is usually a bright metallic green, but varies to a certain extent, and at times may be almost uniformly bronzy, but it always shows a tinge of green and a characteristic metallic lustre.

Calliphora auger Fabr.—This is the smaller yellow blowfly which frequently comes into the house to "blow" meat. It may be easily recognised by the blue abdomen, deeply blotched on either side of the basal segments with yellow, so that the middle and apical portions of the abdomen are blue. The blue on the apical segments is somewhat obscured by a pale-yellow dust. The thorax is blue-grey, and the legs reddish-brown. This fly is a rather stout species measuring about one-third of an inch long.

Calliphora stygia Fabr.—This species is the larger yellow-bodied blowfly which, like *C. auger*, frequents houses, and attracts attention by its persistent buzzing and boisterous flight. The perfect fly is somewhat variable in size, but well-developed specimens may measure up to half an inch in length. The thorax is bluish-grey with a lighter under-surface, and the legs yellow. The abdomen is greenish-tinted, dusted with yellow, the whole of the upper surface clothed with short black hairs. The underside is covered with dense golden hairs, which with the yellow of the abdomen give the fly a distinctly golden appearance. At least eight distinct species—all very similar in appearance to *C. stygia*—have been recognised, of which the Western Australian *C. australis* is one. The relation of each of these species to strike in sheep has not yet been determined.

Chrysomyia rufifacies Macq.—This species is a comparatively robust fly (Plate 102, fig. 8), measuring about one-third of an inch in length. The colour is of a uniform metallic blue, sometimes with a tinge of green, and sometimes bronzy like the greenbottle. The colour is deeper on the edges of the abdominal segments to give the fly a distinctly banded appearance. If examined closely, very few bristles will be detected. *C. rufifacies* at times bears a strong resemblance to *Lucilia sericata*, but may be readily recognised by its more robust appearance, prevailing bluish colour, the presence of the narrow bands across the abdomen, and the comparative lack of bristles. Both of these species may at times be confused with the greenish fly (*Pseudopyrellia* sp.) so frequently seen in large numbers around fresh cow dung. This species is not a blowfly, and its green colour soon turns to a bright blue-violet after death, while the colours of the two blowflies remain constant.

Chrysomyia micropogon Bigot.—In size *C. micropogon* approaches that of the smaller house blowfly *C. auger*. It may be readily recognised by its large reddish-brown eyes, yellow face, uniform metallic dark blue colour, and black legs.

Microcalliphora varipes Macq.—This is the smallest species of the blowflies infesting sheep, being about half the size of the housefly and somewhat more robust, due to its comparatively large head. Its colour is bright metallic green, with a pale-yellow face and mottled legs.

Plate 102.—Sheep Maggot Flies.
(*For description of Plate see page* 407.)

Life History Notes.

There seems to be no distinct strain of flies that attack sheep, for such flies that attack sheep will readily lay their eggs on meat, and, on the other hand, flies that have been reared from meat will oviposit on the wool of sheep. The period of development of the eggs and larvæ on the sheep is much the same as that in meat, and such of the life histories of Queensland sheep blowflies as are known have been obtained by rearing the larvæ in meat.

The life histories of the several species are very similar, differing only in detail. It is, therefore, proposed to deal thoroughly with the life history of only one species—*Lucilia sericata*—mentioning that of the others by way of comparison. The greenbottle has been chosen as it is probably the most important sheep blowfly and has received a good deal of attention from various workers.

The Egg.

The female fly lays her eggs in some sheltered spot in the meat or in the wool. As many as 250 eggs (which are heaped together in a sticky mass) may be laid at any one time. A single female, during her lifetime, may lay 1,000 eggs or more. The newly-laid egg (Plate 102, fig. 1.) is white in colour, and somewhat sausage-shaped. In some of the species—*Calliphora auger* and *Calliphora stygia*—the egg, at times, is retained in the body of the female until it hatches, and is then deposited as a tiny maggot. In summer time the eggs may hatch within sixteen hours, but in midwinter may take as long as three days, or even more in a very cold climate.

The Larva.

From the egg comes the tiny, legless maggot of the fly. The maggot (Plate 102, fig. 2) is of an elongate conical shape, pointed at the anterior end and divided into a number of segments. The maggots of the majority of blowflies are smooth in appearance and whitish in colour, but those of *Chrysomyia rufifacies* (Plate 102, fig. 6) and *Microcalliphora varipes* are brown and so covered with erect tubercles as to give them a hairy appearance. In feeding, a slimy fluid is emitted from the mouth. This fluid has a streng digestive action and liquefies the meat, so making it available to the maggot. The wet and soiled appearance of infested wool is also due to this digestive fluid, which rots the wool fibres. They feed in squirming masses with the pointed head end immersed in the liquefied meat and their blunt hind ends raised above its surface. At this end there is a pair of openings,

---

SHEEP MAGGOT FLY.

Description of Plate 102, *page* 406.

Lucilia sericata Meig.

Fig. 1	Egg x 23.
Fig. 2	Larva x 7.
Fig. 3	Puparium x 7.
Fig. 4	Adult x 7.

Chrysomyia rufifacies Macq.

Fig. 5	Egg x 23.
Fig. 6	Larva x 7.
Fig. 7	Puparium x 7.
Fig. 8	Adult x 7.

known as spiracles, through which the maggots breathe. The necessity of keeping these spiracles clear of the liquid is evident, else the maggots would perish.

In the warmer months the maggots feed rapidly, and are fully fed in four days. In the winter time they feed much more slowly, and may not be fully fed for seven days or more.

The Prepupa and Pupa.

When fully fed, the maggot crawls away from the meat or drops from the sheep, burrowing into the earth to seek protection from birds and parasites. Here it lies motionless for about two days in summer or for twenty-two days or more in winter, preparing for the commencement of the great change in its life from which it will emerge as the adult fly. This quiescent period is known as the prepupal or larval resting period. Gradually the maggot shrinks and its outer skin becomes hardened and turns brown. Inside this hard brown coat or puparium (Plate 102, fig. 3) the whole of the larval tissues break down into a creamy mass, from which the adult structures—the body, legs, and wings—are rebuilt. This is the pupal stage, and may last only six days in summer or as long as seventeen days or more in winter.

Duration of Life Cycle.

From the foregoing it will be seen that in summer time the life cycle of *Lucilia sericata* may be completed in thirteen days and in winter in forty-nine days or more. For *Chrysomyia rufifacies* and *Microcalliphora varipes* the respective periods are nine and thirty-six days, and *Calliphora auger* seventeen and thirty-three days. The life-cycle periods of the remaining species are incomplete, but summer conditions are said to induce the emergence of the adult *Sarcophaga froggatti* in twenty-two days, and of *Chrysomyia micropogon* in twelve days. In the spring *Calliphora stygia* takes about thirty days for its life cycle, and *Peronia rostrata* twenty-six to forty-three days.

The life-cycle periods given above were obtained in Brisbane. It is probable that the western climate of Queensland would be conducive of a good deal of variation in the respective periods, especially in the winter, when the life cycle may extend over a period of several months.

The Adult.

The imprisoned fly, when ready to emerge from the pupa, is able, by means of a pulsating bladder-like organ on the front of its head, to push off the end of the puparium or hard pupal case and work its way to the surface of the soil. *Lucilia sericata* has been known to make its way in this manner through 4 feet of loose soil to the surface.

On emerging, the fly is very soft and drab in colour. It makes its way to some sunny spot where it spreads its wings and raises them up and down to facilitate drying. After a while the bladder is withdrawn into the head, the body and wings dry, the colours of the body become evident, and the insect (Plate 102, fig. 4) is ready to fly off and commence its adult life.

Little has been published of the biology of the adult flies, but certain data concerning their range of flight and longevity is available.

It has been shown that the range of flight of the blowfly *Chrysomyia rufifacies* is at least 10 miles, which can be traversed in about twelve days. This means that flies breeding in a carcase may be distributed over a tract of country 20 miles in diameter—an area of 314 square

miles. The flight of the flies is usually with or slightly across the wind, but carrion may be followed against a slight breeze.

The length of life of the adult or fly stage of *Chrysomyia rufifacies* in the field has been determined as at least twenty-eight days. In South Africa a sheep blowfly (*Chrysomyia chloropyga*) is recorded as living eighty-two days; so the longevity of the Australian species is probably much longer than that recorded.

Blowflies appear most susceptible to hot, dry conditions. Moisture is essential for larval development, and under dry conditions the larvæ and adults rapidly succumb. During the heat of summer or during a prolonged drought blowflies are scarce and the sheep are not attacked, but, given mild, showery weather, the flies increase very rapidly and strike among sheep is frequent. In Queensland strike appears more prevalent in the late summer and autumn and in the spring and early summer, being consequent on the mild conditions and seasonal rains. If the winter is mild and wet, infestation may be continuous, disappearing only as the heat of the summer becomes intolerable to the flies.

Why Strike in Sheep Occurs.

Various theories have been advanced at different times to explain blowfly infestation of sheep. It has been suggested that in the prolonged droughts of past years the blowflies bred up in enormous numbers in the carcases of sheep, and from laying their eggs on the wool of these carcases gradually acquired the habit of ovipositing on the wool of live sheep. The large-scale destruction of rabbits in the States overrun with these pests has also been blamed for breeding immense numbers of flies. The breeding of sheep heavily wrinkled in the breech and thereby increasing the possible attractiveness of body secretions has been demonstrated to be one of the causes of strike.

Modern research supports the opinion that myiasis in sheep—i.e., the attack of any living animal by fly larvæ—may be traced in Australia to the introduction and subsequent spread of the English greenbottle (*Lucilia sericata*). In the first place, myiasis of sheep is known also in the British Isles, parts of Europe, North America, South Africa, and New Zealand, and in each and every one of these countries *Lucilia sericata* is present and is known to "blow" sheep; secondly, from numerous samples of freshly "blown" wool *Lucilia* only has been bred; and thirdly, this fly occupies a position in regard to carrion which is probably analogous to that held in regard to sheep. It has been shown that the greenbottle is the first blowfly to arrive and lay its eggs after the death of any animal, and it will oviposit only whilst the flesh is comparatively fresh. Its larvæ create suitable conditions in the flesh for the attraction and oviposition of the other species—chiefly the *Chrysomyias;* and without previous blowing by *Lucilia* the *Chrysomyias* will not lay their eggs on carrion. It would seem, therefore, that *Chrysomyia rufifacies,* which, on account of the voracious habits of its maggots, has always been generally regarded as one of the worst sheep blowflies, will only attack a sheep previously "blown" by *Lucilia.* The position of *Calliphora auger* and *Calliphora stygia* is not yet satisfactorily defined, but as *Calliphora auger,* at least, is known as a primary "blower" of carrion, it may also act similarly with sheep. *Lucilia sericata* is, however, regarded as of the major importance, and it has been said that in its absence the frequency of strike would be considerably reduced.

A NOTE ON THE OCCURRENCE OF SARCOPTIC MANGE AMONG PIGS IN QUEENSLAND.

By F. H. S. ROBERTS, M.Sc., Entomological Branch.

SARCOPTIC mange has no doubt existed among pigs in this State for many years, but, so far as the writer is aware, no actual record has previously been published on the isolation and identification of the mite concerned.

In June last, scrapings of mange crusts from a pig at Murgon were submitted for examination by Mr. L. A. Downey, H.D.A., the Instructor in Pig Raising. *Sarcoptes scabiei* var. *suis* was shown to be the cause of the disease.

Some two months later attention was drawn by Mr. E. J. Shelton, H.D.A., the Senior Instructor in Pig Raising, to a Tamworth boar suffering from a severe type of skin trouble. Scrapings showed the presence of numerous Sarcoptic mange mites. The disease was in a very advanced stage, practically the whole skin area showing evidence of mite attack. The parasites were most active on the abdomen and throat, whilst on the back, shoulders, hams, and flanks the mites were comparatively scarce, the dry scurfy condition of these areas denoting "dry mange." The intense irritation had been followed by loss of condition and the formation of raw and bleeding areas through constant scratching and rubbing. The scabs in the skin folds had been broken by the movements of the animal and blood and serum had oozed out from the cracked surfaces.

Determination of mite mange is made, as mentioned above, from skin scrapings. As the mites burrow fairly deeply into the skin, the scrapings should be made deep enough to cause the appearance of blood.

Crude petroleum or fuel oil at a cost of 1s. per gallon is one of the most effective remedies. The affected animal should be well washed with soap and water and allowed to dry before the oil is applied, and should be kept in the shade until the oil has disappeared, usually about three days.

As many of the eggs may not be killed by the oil, a second application is necessary four days later, in order to destroy the ensuing mites before they reach maturity.

SALT FOR PIGS.

Visiting a well-known stud piggery in the metropolitan area of Brisbane recently, it was noticed that the man in charge of the pigs kept a bag of coarse salt (usually known as pickling salt) close to the feed boiler. When asked if he used salt in the food the man replied that he regularly added a handful of salt to the food when preparing same for cooking, for he had noted over a series of years that the pigs always made better growth and had better appetites when a little salt was added to their food.

The quantities used would, of course, be important, and should not exceed, say, one-half teaspoonful per pig per day, but it has a good food value, and is a necessity in all rations. Care must be taken not to force the pigs to consume too much salt, and the water in which corned beef or ham has been boiled should not be used as pig food, unless distributed over a large quantity of food.

Salt is a necessity, so also is charcoal, wood-ashes, and bone-meal. A cup full of lime water added to the pig's food occasionally will also be productive of good results.

The careful farmer watches all these points and sees to it that his pigs do not suffer as a result of a deficiency of mineral matters.

SUBSOILING OF MR. W. JACKSON'S FARM AT NORTH ETON, MACKAY.

Mr. W. Jackson, of North Eton, Mackay, who is known to all Mackay sugar-growers as a thoroughly up-to-date cane farmer, has recently introduced subsoiling on his farm, which, incidentally, is one of the best in the Mackay district. The photograph appearing below will give some idea of the work carried out.

For many years past Mr. Jackson has been a firm believer in the use of sugar-mill refuse, such as filter press cake, wood ash, and molasses, and it may be said that he has obtained very fine results. He was one of the pioneers in the Mackay district in the use of molasses as a fertilizer, and a visit to his farm is well worth while.

Plate 103.

Plate 104.

CLIMATOLOGICAL TABLE—AUGUST, 1931.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·02	81	68	85	15, 16	59	12	66	6
Herberton	..	72	52	83	31	39	11	61	7
Rockhampton	30·11	79	55	84	12, 22	42	1	20	5
Brisbane	30·14	72	51	80	7	44	1	90	7
Darling Downs.									
Dalby	30·13	72	43	79	21	28	1	27	3
Stanthorpe	..	63	37	72	12	22	24, 1	72	9
Toowoomba	..	64	43	72	7, 12, 21	30	24	38	6
Mid-Interior.									
Georgetown	30·00	87	57	91	31	42	24	0	..
Longreach	30·08	81	48	88	6	37	24	0	..
Mitchell	30·14	72	39	82	14, 21	27	23, 24, 25	13	1
Western.									
Burketown	30·02	84	59	91	18	45	25	0	..
Boulia	30·09	80	48	92	5	39	25, 26	0	..
Thargomindah	30·13	69	42	84	27	37	24, 25, 29, 9	2	1

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1931 AND 1930 FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.,	No. of Years' Records.	Aug., 1931.	Aug., 1930.
North Coast. ..	In.		In.	In.
Atherton	0·80	30	0·77	0·05
Cairns	1·70	49	1·15	0·97
Cardwell	1·26	59	0·52	0·20
Cooktown	1·26	55	0·66	0·14
Herberton	0·62	44	0·61	0·05
Ingham	1·45	39	0·23	0·18
Innisfail	4·97	50	2·57	1·93
Mossman Mill ..	1·21	18	1·10	0·89
Townsville	0·51	60	0·10	0·05
Central Coast.				
Ayr	0·58	44	0	0·11
Bowen	0·66	60	0·11	0
Charters Towers ..	0·56	49	0·01	0
Mackay	1·06	60	0·18	0·89
Proserpine	1·33	28	0·22	0·30
St. Lawrence ..	0·84	60	0·32	0·13
South Coast.				
Biggenden ..	1·11	32	0·18	1·87
Bundaberg	1·31	48	0·90	2·64
Brisbane	2·03	80	0·90	1·76
Caboolture	1·57	44	1·02	2·59
Childers	1·24	36	0·94	2·28
Crohamhurst ..	2·21	38	2·95	2·96
Esk	1·54	44	0·66	1·65
Gayndah	1·18	60	0·23	1·79
Gympie	1·75	61	0·62	1·93

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.,	No. of Years' Records.	Aug., 1931.	Aug., 1930.
South Coast—continued:	In.		In.	In.
Kilkivan	1·49	52	0·39	3·00
Maryborough ..	1·69	59	2·87	3·43
Nambour	1·87	35	1·65	2·15
Nanango	1·35	49	0·49	1·19
Rockhampton ..	0·97	44	0·20	1·41
Woodford	1·74	44	1·67	1·77
Darling Downs.				
Dalby	1·23	61	0·27	2·50
Emu Vale	1·17	35	0·05	1·36
Jimbour	1·20	43	0·30	1·38
Miles	1·16	46	0·06	1·54
Stanthorpe ..	1·82	58	0·72	2·49
Toowoomba ..	1·69	59	0·38	1·73
Warwick	1·51	66	0·23	1·13
Maranoa.				
Roma	0·95	57	0·02	0·81
State Farms, &c.				
Bungeworgorai ..	0·83	17	0	0·53
Gatton College ..	1·05	36	0·46	0·92
Gindie	0·67	32	0·54	0
Hermitage ..	1·31	25	0·15	1·63
Kairi	0·84	17	..	0
Mackay Sugar Experiment Station	0·92	34	0·04	0·60

J. H. HARTSHORN, Acting Divisional Meteorologist.

HARVESTING AND PACKING LEMONS FOR MARKET.

JAS. H. GREGORY, Instructor in Fruit Packing.

SIZE is an important factor in lemon-marketing, large over-grown fruit not being popular with the retailers. A good commercial size is a lemon $2\frac{1}{2}$ to $2\frac{5}{8}$ inches in diameter. Coarse, over-developed lemons are often produced when they are allowed to ripen on the tree. Lemons are best harvested just as they begin to change colour. Fruit picked at this stage will also cure to perfection, and, when modern artificial colouring methods are used, a first-grade, well-coloured fruit is obtained. Handled carefully, fruit properly cured, whether coloured or not, will keep for many weeks. Care in handling should be shown through all stages from the picking to the marketing.

Harvesting.

Lemons picked to be stored and cured or transported over long distances should be carefully clipped. It is best to make two clips—one to remove the fruit from the tree, and a second to remove, if any, the surplus stalk. Gloves should be worn whilst handling, to avoid fingernail damage. The best type of clipper is the parrot-nosed type. Picking bags, if used, should be used with great care, as they are often a source of great damage to fruit when carelessly handled, causing stalk rubs, with the added chance of mould infection. It will be found that baskets, or kerosene tins cut lengthwise and provided with a handle, are most satisfactory for harvesting. Fruit should never be tipped or rolled into the harvesting boxes.

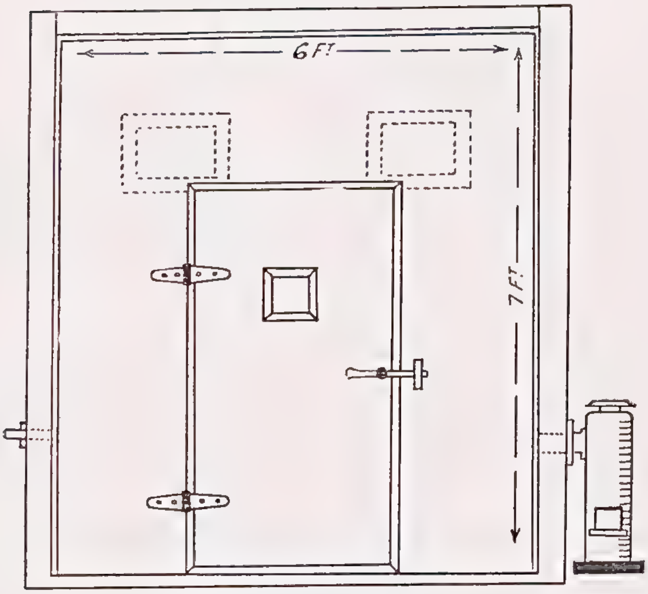
Curing.

After harvesting, the lemons should be taken immediately into the sheds to avoid any chance of becoming heated, and there sorted carefully into clean and dirty fruit. The clean fruit should be placed in trays or open-sided boxes made on the flat, and then stacked in a cool place. Dirty fruit should be washed carefully and wiped and spread out in a draught to dry thoroughly. After drying, it should be placed in trays or boxes, and stacked with the other clean fruit and allowed to sweat. Care must be taken that the trays or boxes are stacked to permit a free circulation of air through and around the fruit. After being sweated thoroughly, which usually takes from a week to fourteen days, the fruit should be sized carefully and wrapped for market. Lemons can be kept for a great length of time when these operations are carried out carefully, but it must be remembered that they will lose considerably in size when kept for lengthy periods; and when packed and stored for any time it is necessary to repack to remove any possible wasty fruit, and to tighten up the slackness of the pack through shrinkage. It is always necessary to see that all gear used in the handling of lemons is kept clean. Frequent sprayings with formalin solution (1 to 20)—one part of formalin to twenty parts of water—will be of great help in controlling mould infection from containers, or machinery infected with mould from waste fruit.

ARTIFICIAL COLOURING.

A modern method of artificial colouring is the ethelyne gas treatment. The fruit is placed in a gas-tight chamber, and the gas, which is procured in cylinders, with gauges for measuring attached, is injected into the chamber, the quantity being 1 cubic foot of gas to each 1,000 cubic feet of space in the room. For best results during colouring, an even temperature of about 65 degrees Fahrenheit should be maintained.

Fruit should be spread out on trays and stacked in the chamber so that the gas has free access to the fruit, battens being placed on the floor to stand the bottom layer of fruit upon. Trays to hold a single or double layer of fruit are excellent, but expensive. Growers may use cases if necessary. Cases should be made open at the side, with the boards spaced apart. It is recommended that the same cases be used always for the process, as they can then be kept clean and free from fungus infection. Spraying the chamber and cases occasionally with a 1 in 20 solution of formalin will assist in eliminating infection from moulds. In applying the gas, nothing is gained by using a larger quantity than necessary. After the necessary quantity of gas has been applied at the correct temperature, shut off the gas and allow the room to remain closed for at least four hours. Then open the chamber and ventilate the fruit completely to renew the oxygen. This needs to be done as completely and quickly as possible to keep the temperature of the fruit from changing in any marked degree. It is of advantage to allow the fruit to stand without gas for one to two hours before recharging the chamber. Two applications of gas a day are sufficient, but an extra application will assist in having the fruit coloured ready for market sooner. The same method is used for



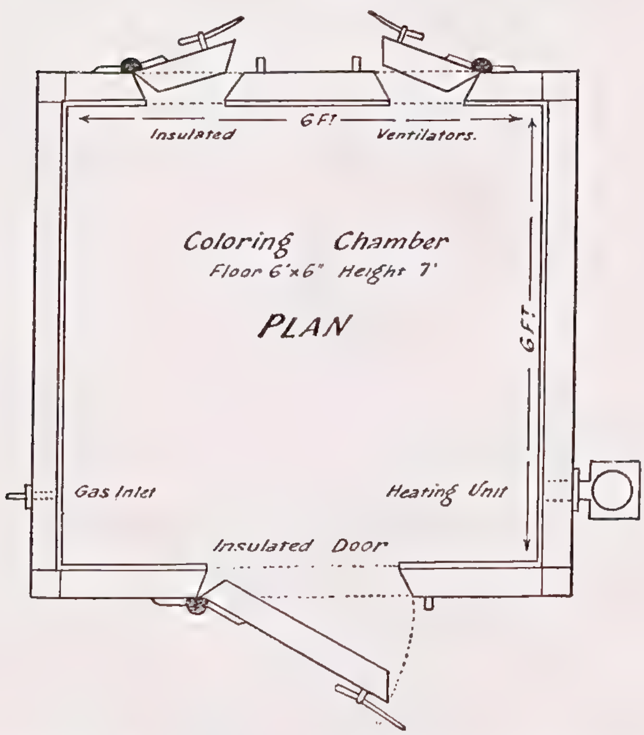


Plate 105 (Fig. 1).—Plan and Elevation for Colouring Chamber.

Note.—The placing of the door with its inspection window and ventilators, which should be made as gas-tight as possible. Provision is also made for artificial heat and the application of the gas.

each application, nothing being gained by recharging sooner than four hours after the previous application of the gas. Lemons properly cured and coloured by this process have a greatly enhanced appearance, and will keep for many weeks when stored in a cool, dry place. It is advisable to use care in colouring if oil sprays have been used on the trees, as the skin of the fruit is inclined to burn through chemical reaction.

When using the ethelyne gas treatment, the following points should be observed closely:—

Have a temperature of 65 degrees approximately in the gas chamber.

Have fruit packed loosely in boxes of trays.

Apply gas in the quantity necessary according to the size of the room, at 1 cubic foot of gas to each 1,000 cubic feet of space.

Allow the room to remain closed for at least four hours.

Open and ventilate the fruit fully to renew oxygen.

Repeat the same process for further applications.

Remember that nothing is gained by overcharging or charging the chamber too often, and it is costly.

Care should be taken to keep all naked lights away from the room or cylinder when using the gas, as the mixture becomes dangerous when a large quantity of gas is mixed with air.

BUILDING THE GAS CHAMBER.

The building may be constructed of suitable timber, insulated and lined, or built of iron, which is hard, however, to make gas-tight. The process is done quicker and more efficiently with less waste if the chamber is made gas-tight. To make a gas-tight chamber, which means a large saving in the quantity of gas used, the space between the outside wall and the lining boards should be insulated by filling with sawdust, wood shavings, charcoal, or other suitable material. This is also a big factor in maintaining an even temperature. Paper-lining in addition to the filling is an additional improvement. In filling the cavity between the outside wall and lining boards, trouble can be avoided by building the wall and lining at the same time, and placing the filling in position as the wall is erected. As a sufficient supply of oxygen must be maintained in the room, it is necessary to change the air after every application of gas. To do this successfully, ventilators should be placed at the opposite end of the room to the door. The door and ventilators (See Fig. 1) should be made as close-fitting as possible, and insulated in the same manner as the walls to obtain best results. By placing the ventilators at the opposite end to the door, the air can be quickly changed in the room by opening both at the same time, without causing any undue variation in temperature.

Temperature Control.

Heating to obtain the correct average temperature of 65 degrees Fahrenheit may be necessary in some climates, so provision should be made when building the gas chamber for the erection, where necessary, of a heating system. By building the room in a corner of the packing shed a more even temperature may be maintained, and in many parts of Queensland should make it unnecessary to instal heating apparatus.

It should be remembered that during warm periods, to help keep the temperature low, it is necessary to allow the fruit to cool before placing it in the chamber. A chamber 6 ft. by 6 ft. by 7 ft. will hold fifty cases stacked loosely. Changeable climatic conditions will affect the humidity of the inside of the chamber. If the lemons show signs of withering during the colouring process, it will help to stop this withering if the humidity is increased by placing a dish of water or wet bags in the chamber. To avoid opening the chamber unnecessarily, the thermometer should be placed in the chamber where it can be seen without opening the door. A small window built in the door will allow of easy observation of the interior of the chamber.

PACKING FOR MARKET.

Types of Cases.

The Australian Dump case, 18 inches long by 8⅝ inches wide by 14¼ inches deep, is an excellent case to use for packing lemons. The Canadian Standard case, 18 inches long by 11½ inches wide by 10½ inches deep, is also an excellent container. Both of these cases lend themslves admirably to the count system of packing. Such cases as the Long Bushel and other types of cases have not the same satisfactory features as those mentioned previously. Cases of the Long Bushel type do not permit of easy packing, being too narrow, causing skin damage to the fruit

through rubbing on the side of the case whilst being placed in the bottom layers. The quantity of fruit touching the wood is also a source of increased damage through pressure and vibration whilst in transit. These cases, being narrow, do not lend themselves to standard-count packing, variation in the type of pack having to be used, making it practically impossible to have a definite system of standard counts for buyers. Most packs in cases of this description give the buyers the impression that the cases are only half-filled, owing to the large number of packs with large spaces showing between the fruit. Buyers, seeing this and not knowing the number of fruit in the case, inevitably cut the price to safeguard themselves.

Wrapping.

It is always advisable to wrap lemons for the market. The wrapping of lemons isolates each individual fruit from the possibility of mould infection from its neighbour, so that in the event of one fruit becoming affected the wrapping paper is a means of preventing infection to the fruit next to it. Wrapping also assists in making a better pack, as there is not the tendency for the layer of fruit to buckle and slip about as when fruit is packed unwrapped. When wrapping lemons, the fruit should be placed in the wrapping paper and the ends of the paper folded under and on to the cheek of the fruit, forming a pad on which the fruit is placed, giving a very finished and neat appearance to the wrapped and packed layer.

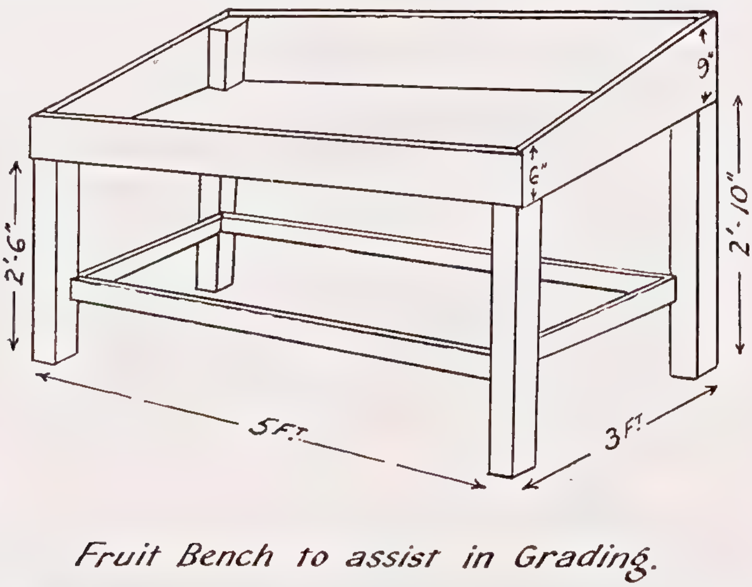


Plate 106 (Fig. 2).—Fruit Bench to Hold Fruit whilst Packing.

Where there is no mechanical sizer this type of bench is very useful. Greatest efficiency is obtained when only one case at a time is tipped for packing. Please note that the bench is higher at the back than at the front, allowing the fruit to always be close at the packer's hand.

Sizing.

Sizing the fruit before packing assists greatly in making packs easy to do and easy to bring to the correct height in the case, although there are packers who find no difficulty in packing unsized fruit by using a roomy bench (See Fig. 2) to hold the fruit and tipping one case only on the bench at a time. The packer then packs two different sizes at the same time, and, while packing, sorts the remaining sizes into separate heaps on the bench. Growers who are fortunate enough to have a mechanical sizer will find the operation of packing made easy, provided care is taken to avoid the pitfalls associated with mechanical sizers. Firstly, it should be remembered that in practically all mechanical sizing machines two different counts of fruit can be packed from each bin, packing being made very easy if this rule is observed. To enable this to be done, it is well to have packing stands of the type illustrated (Fig. 3). Another point well worth remembering with the roller and belt type of sizing machine is to have the correct gear ratio between the carrying belt and the sizing roller. The gear wheels necessary for this to be done should be supplied by the manufacturer with the machine.

Fruit is always sized according to the measurement of its diameter, the following sizes being used:—2 inches, 2¼ inches, 2½ inches, 2¾ inches, and 3 inches. The size is determined by having a set of rings made with these diameters, the lemon being placed on the ring with the stalk up. Any lemon that will fall through a 2¼-inch ring is classified as a 2-inch lemon. Likewise, a lemon that will go through a 2½-inch ring and not through a 2¼-inch is classed as a 2¼-inch lemon. This method is repeated to determine all sizes. A handy gauge can be cut from a piece of three-ply with a washer-cutter or carpenter's expansion bit.

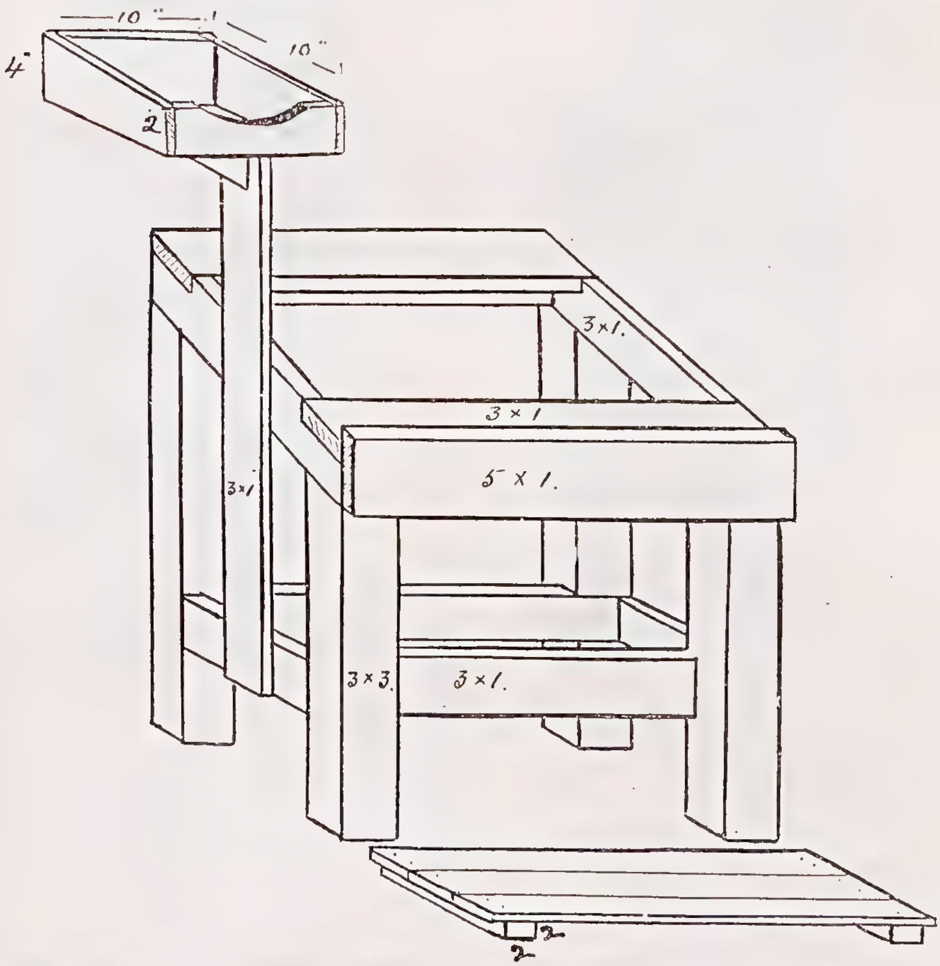


Plate 107 (Fig. 3).—Packing Stand with Paper Holder and Spring Board.

This stand is tilted and holds two cases. The tilt assists the packer by keeping the lemons in position. The packer by packing two cases of different sizes at the same time is assisting himself in his sizing.

Packing.

The standard diagonal check system of packing is best. This pack has the following advantages:—

A given size of fruit will always come to the correct height in the case.

The packed fruit will always appear in straight lines diagonally, across and up and down the case, whether opened on the top, bottom, or sides.

No two lemons will rest upon the other, but in the pockets formed between the fruit of the layer beneath.

The height of the fruit in the case can be governed by making the pockets larger or smaller.

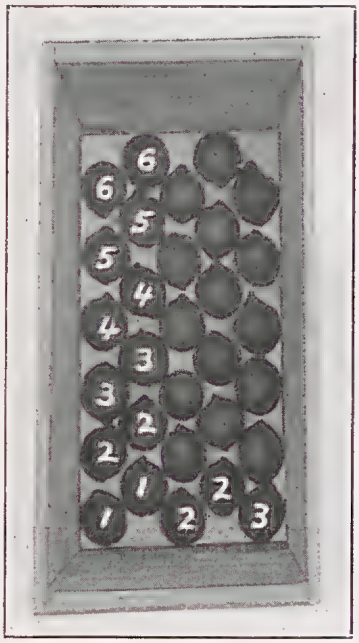
The quantity or number of fruit in the case is always the same for each pack, and can be ascertained at a glance.

By using the packing stand illustrated (Fig. 3), the cases are slightly tilted, which helps to keep the fruit in position. making the packing much easier. The packer stands with the two cases to be packed into in front of him, with the fruit on one side of the cases and wrapping paper on the other. The bench with the fruit on should be made tilted to permit the fruit to run to within easy reach of the packer.

The packs used are called the 3 - 2 (see Fig. 4) and the 2 - 2 (see Fig. 4). These packs get their name from the way the first two lines of fruit are placed in the first layer.

How to Read and Use the Packing Table.

The Layer Count is obtained by counting two lines of fruit from end to end in the case, this layer count being 6 x 6.



3–2 Pack.

The Pack gets its name from the way the first five lemons are placed in the layer.

The Layer Count is obtained by counting two alternate lines of fruit from end to end in the case, this layer count being 4 x 4.

2–2 Pack.

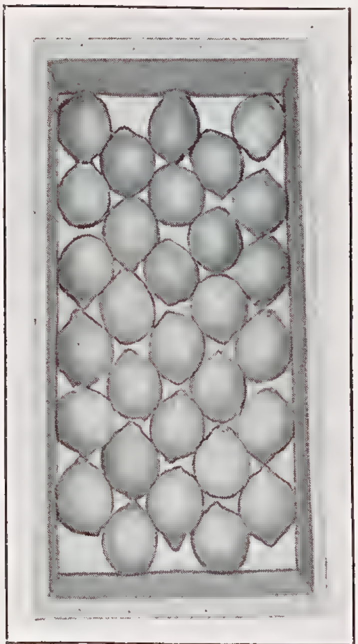
The Pack gets its name from the way the first four lemons are placed in the layer.

Plate 108 (Fig. 4).

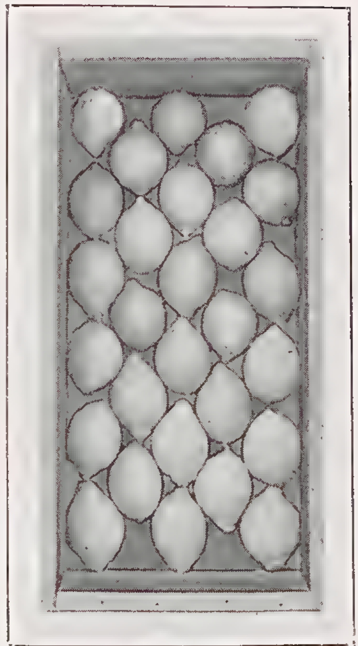
3 x 2 Pack.

In the 3 - 2 pack the first layer is started by placing a lemon in each corner of the case and one exactly midway between them facing end to end in the case, the stalks facing the packer, and the nipples facing to the other end of the case. This forms a line of three lemons with two spaces, or pockets, between them. The pack is continued by placing two lemons in these spaces, which leaves three pockets between the two lemons. We repeat the placing of three lemons in the pockets and then alternately two and three until the layer is finished, except for the last line of fruit; this is reversed with the stalks facing the wood of the case end furthest from the packer. To start the second layer (see Fig. 8), place two lemons in the pockets formed by the first three lemons of the first layer, then two and three alternately facing as in the first layer, until all the pockets of the first layer are filled, again reversing the last line of fruit across the case. This process is repeated layer by layer until the case is filled. With the 3 - 2 pack we get packs containing eight (see Fig. 7) and nine layers (see Figs. 5 and 6). (See packing table.) An easy way for the beginner to be able to know the number of layers in a case is to remember that in the case of the 3 - 2 pack the first, third, fifth, seventh, and ninth layers will start with three at the end, and the second, fourth, sixth, and eighth layers start with two at the end of the layer. The reason for the need of knowing this is explained in the paragraph on bringing the pack to the correct height in the case.

3–2 Packs.
First Layers.

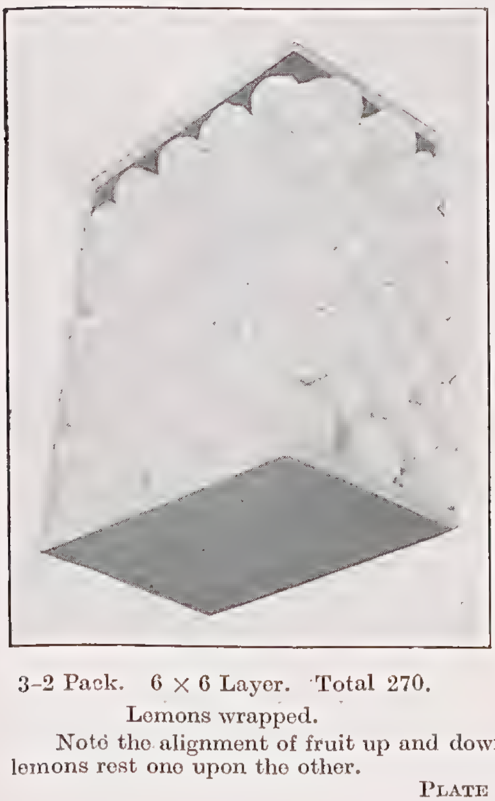


3–2 Pack. 6 × 6 Layers. 9 Layers.

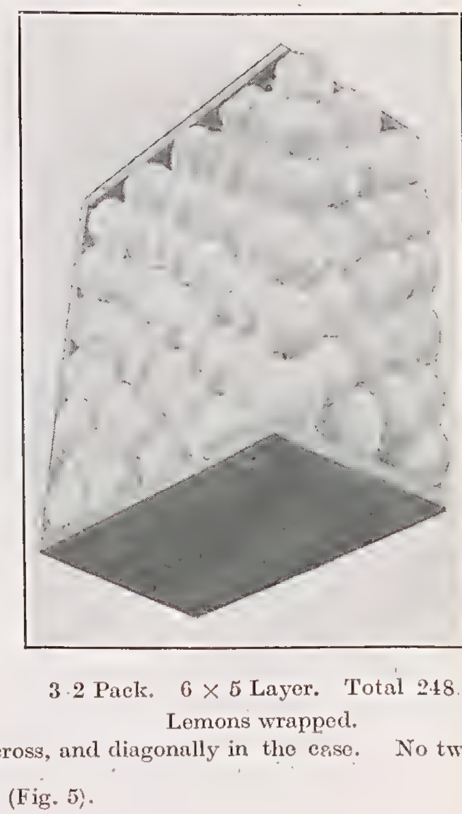


3–2 Pack. 6 × 5 Layers. 9 Layers.

Finished Cases.



3–2 Pack. 6 × 6 Layer. Total 270.
Lemons wrapped.



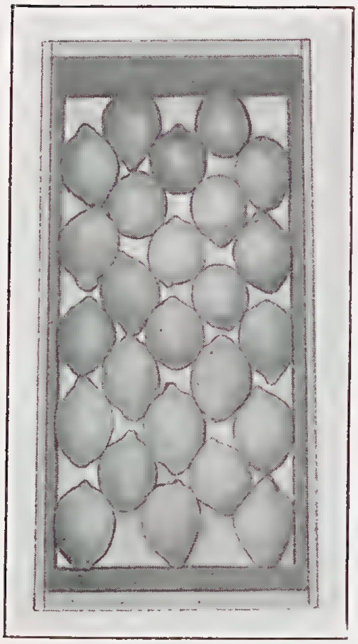
3–2 Pack. 6 × 5 Layer. Total 248.
Lemons wrapped.

Note the alignment of fruit up and down, across, and diagonally in the case. No two lemons rest one upon the other.

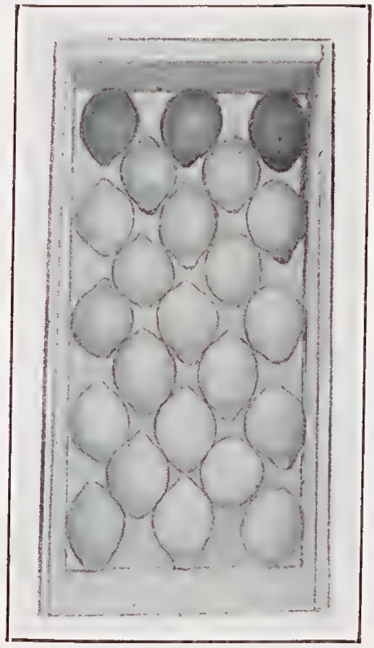
Plate 109 (Fig. 5).

3–2 Packs.

First Layers.

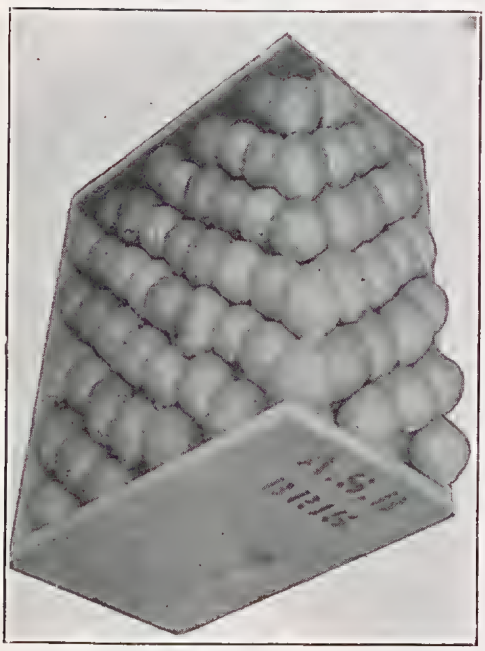


3–2 Pack. 5 x 5 Layers.
9 Layers.

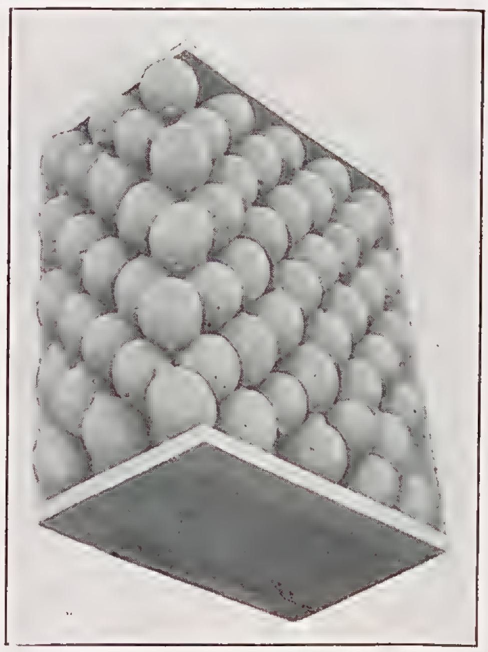


3–2 Pack. 5 x 4 Layers.
9 Layers.

Finished Cases.



3–2 Pack. 5 x 5 Layers. Total 225.



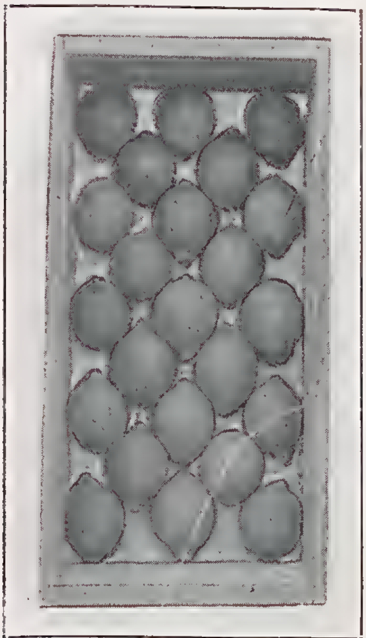
3–2 Pack. 5 x 4 Layers. Total 203.

Note the alignment of fruit up and down, across, and diagonally in the case. No two lemons rest one upon the other.

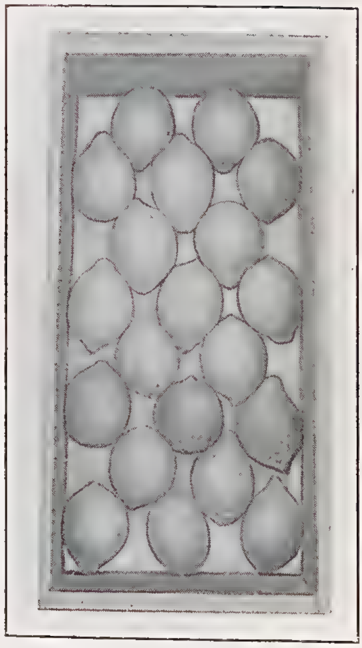
Plate 110 (Fig. 6.)

3–2 Packs. 8 Layers.

First Layers.

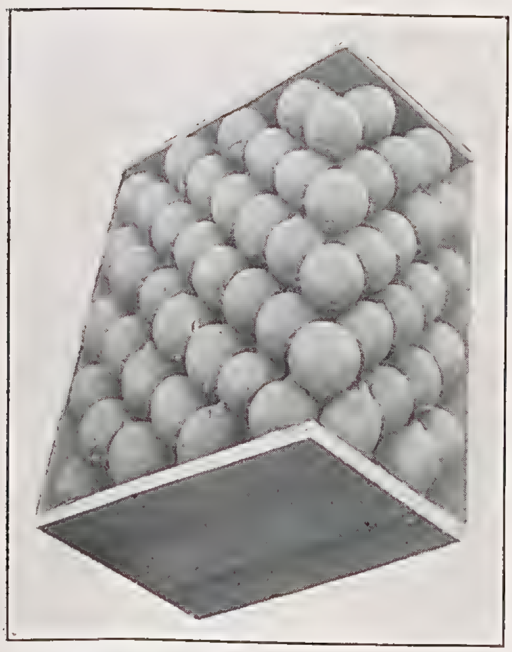


3–2 Pack. 5 × 4 Layers. 8 Layers.

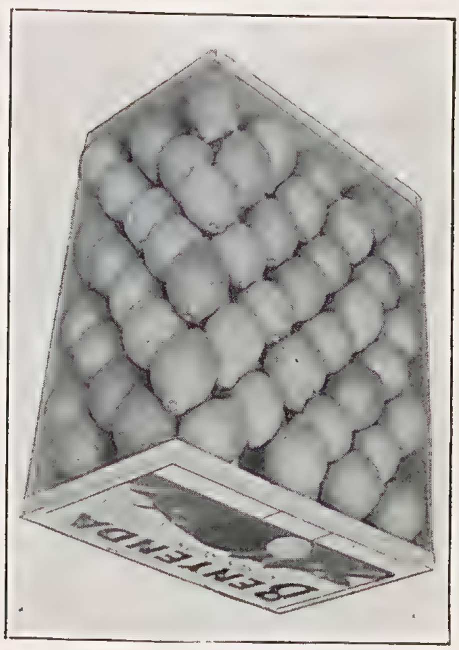


3–2 Pack. 4 × 4 Layers. 8 Layers.

Finished Cases.



3–2 Pack. 5 × 4 Layers. Total 180.
Note.—Do not confuse with 2–3 Pack, which looks the same.

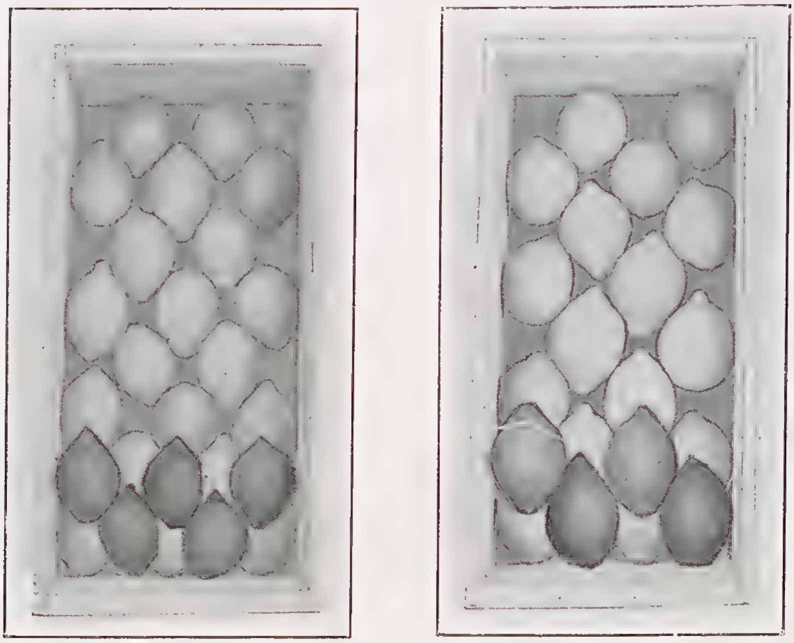


3–2 Pack. 4 × 4 Layers. Total 160.
Note distinctive label.

Plate 111 (Fig. 7).

How to Start the Second Layers.

3–2 Pack. 2–2 Pack.



Note how the lemons are placed on the pockets or spaces of the first layer, the second layer starting with two instead of three.

Note how the first two lemons of the second layer are placed on the pockets of the first layer.

Plate 112 (Fig. 8).

PACKING TABLE FOR PACKING IN THE AUSTRALIAN DUMP CASE.
(18 inches long x $8\frac{2}{3}$ inches wide x $14\frac{1}{4}$ inches deep.

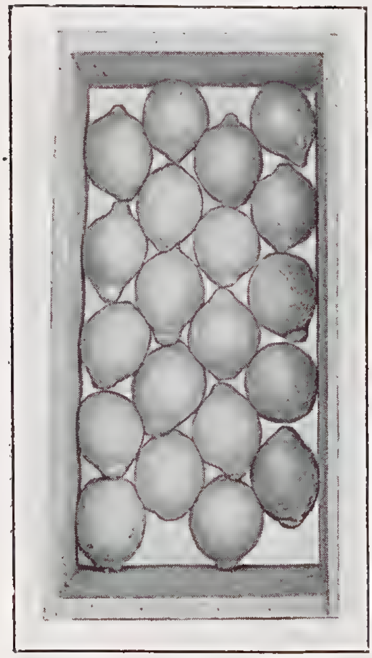
Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total or Count.
2 inches	3-2	6 × 6	9	270
	3-2	6 × 5	9	248
	3-2	5 × 5	9	225
$2\frac{1}{4}$,, ...	3-2	5 × 4	9	203
	3-2	5 × 4	8	180
	3-2	4 × 4	8	160
$2\frac{1}{2}$,, ...	2-2	5 × 5	7	.. 140
	2.2	5 × 4	7	126
$2\frac{3}{4}$,, ...	2-2	4 × 4	7	112
	2-2	4 × 3	7	98
3 ,, ...	2-2	3 × 3	7	84

Special Note.—In the 180 and 203 count the same number of fruit is contained in each layer, but there is an extra layer in the case. This is brought about by the difference in the diameter of the fruit and the size of the pockets. Close attention to the directions in reference to the 3.2 pack will enable the packer to bring fruit to the correct height.

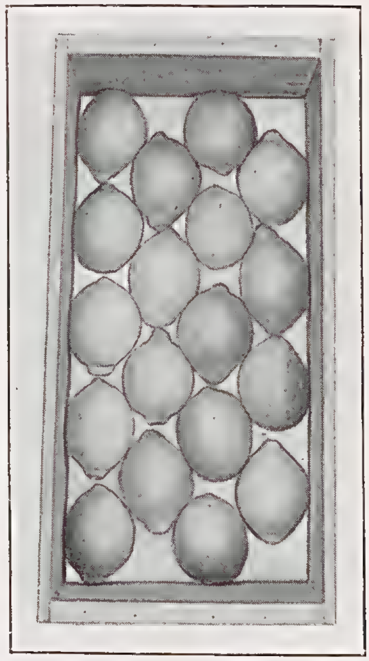
2 x 2 Pack.

This pack is started by placing a lemon in the bottom left-hand corner of the case, and midway between the lemon and the right side of the box a second lemon, leaving two pockets between the two, in which the next two lemons are placed, forming the two-two from which the pack derives its name. (Figs. 9, 10, and 11.) This is then repeated, the lemons being placed facing as in the 3 x 2 pack until the

2–2 Pack. 7 Layers.
First Layers.

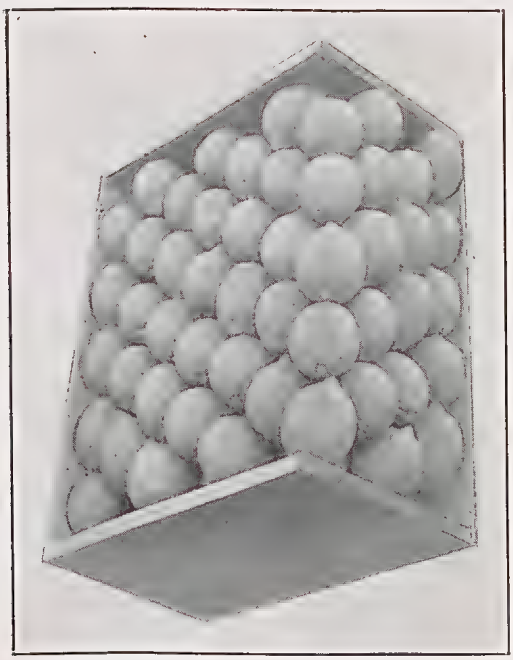


2–2 Pack. 5 × 5 Layers. 7 Layers.

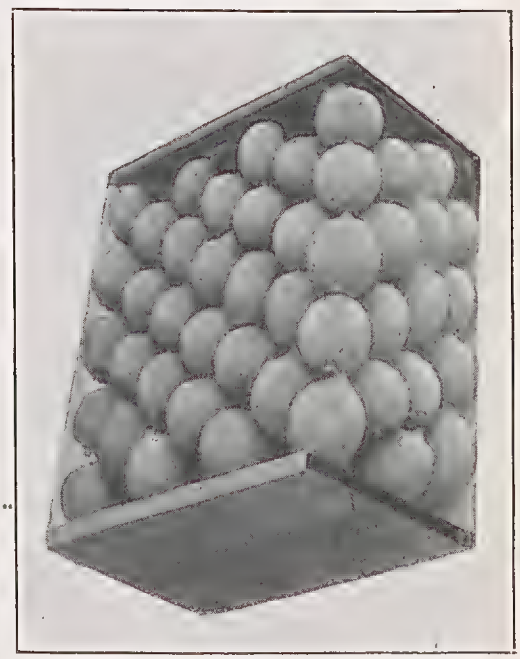


2–2 Pack. 5 × 4 Layers. 7 Layers.

Finished Cases.



2–2 Pack. 5 × 5 Layers. Total 140.

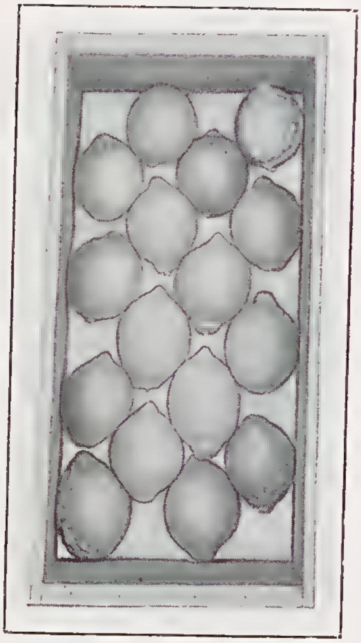


2–2 Pack. 5 × 4 Layers. Total 126.

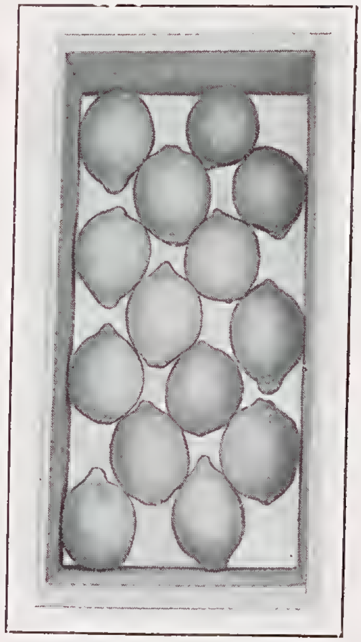
Plate 113 (Fig. 9).

3–2 PACKS. 7 LAYERS.

First Layers.

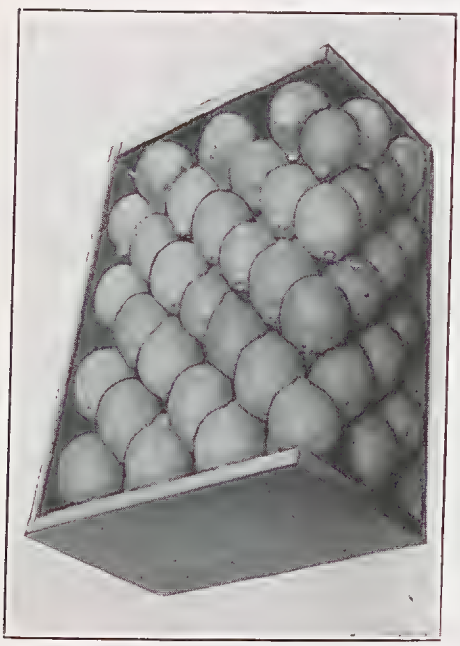


2–2 Pack. 4 x 4 Layers.
7 Layers.

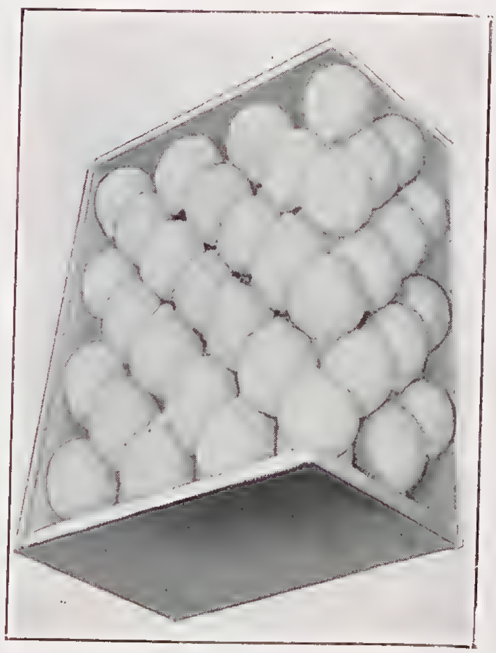


2–2 Pack. 4 x 3 Layers.
7 Layers.

Finished Cases.



2–2 Pack. 4 x 4 Layers. Total 112.



2–2 Pack. 4 x 3 Layers. Total 98.

PLATE 114 (Fig. 10).

layer is finished with all but the last line of fruit. This is reversed, with the stalks facing the wood of the case end furthest from the packer. The second layer is started by placing two lemons on the pockets formed by the first two of the first layer (see Fig. 8), the layer being finally finished by placing lemons on all the pockets of the first layer and reversing the last line of fruit as in the first layer. By repeating this layer by layer the case is finished. It will be noticed by referring to the table that the 2 - 2 packs contains seven layers. If close attention to the rule of starting the first layer in the left-hand corner is observed, the number of layers in the case can be easily counted, the first, third, fifth, and seventh layers starting in the left-hand corner, and the second, fourth, and sixth layers starting in the right-hand corner.

Bringing the Pack to the Correct Height in the Case.

Lemons should be packed 1 inch to $1\frac{1}{2}$ inch above the top of the case, and be gently eased into position before applying the lid. After nailing, both the lid and bottom of the case should show a bulge. Care should be taken that the bottom of the case, while nailing, is kept clear of the floor or nailing-down stand. This can be done by placing a block under one end of the case while easing the fruit into position and nailing.

Knowing the number of layers in a case at any stage of packing is a good guide to a packer. By calculating the height the fruit will come to in the case two or three layers before the top is reached, the packer, by applying the rule, ''The size of the pockets governs the height of the fruit in the case,'' can bring the fruit either higher or lower, as necessary. This is done by making the pockets smaller by slightly increasing the size of the fruit, and bringing the fruit higher in the box to correct a pack which will come too low, or, in the case of a pack that is coming high, to open the pockets by reducing slightly the size of the fruit. Usually these faults are caused by a variation in sizing the fruit in the subsequent layers after placing the first layer in position. Cases not of the correct width are often the cause of trouble in bringing to the correct height, but by following the rule governing the size of the pockets this difficulty may be overcome. It should be remembered that it is an offence against the Fruit and Vegetables Act to market fruit in undersized cases.

Packers observing the following rules should have no difficulty in obtaining good results with their packing:—

1. All fruit should be placed on its cheek facing end to end in the case.
2. Reverse the last two or three lemons, as the case may be, in each layer.
3. See that all fruit appears in straight lines from end to end in the case, across and diagonally.
4. No two lemons must rest directly one upon the other, but in the pockets of the layer beneath.
5. The size of the pockets governs the height of the fruit in the case.

After taking care in packing, growers should be careful to attend to the outside appearance of the fruit. A well-chosen label is an attraction to buyers, being quite a cheap advertising medium, the average coloured label costing very little. Growers not marketing fruit in sufficient quantity to warrant an outlay on labels may still make their cases look attractive by neat stencilling. Under the Fruit and Vegetables Act it is necessary for the packer to brand his initials, name, and address legibly and durably within a space measuring not less than 5 inches long by 2 inches wide. The name of the variety of fruit and the size or count should also be branded in letters of not less than $\frac{1}{2}$ inch in length.

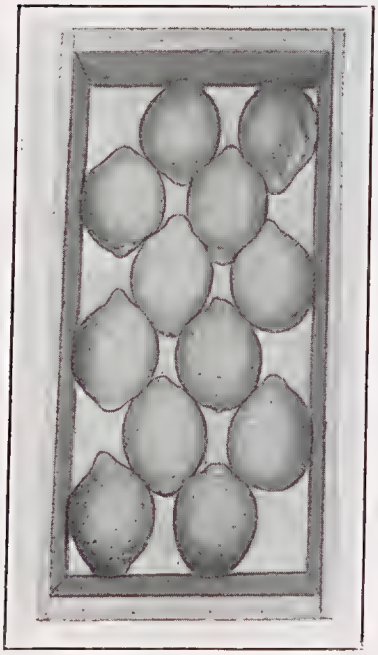
Wiring.

A machine for this purpose is obtainable commercially. Wiring is recommended in all cases. Many country-order buyers pay extra to obtain cases wired, as it saves them time and money when they can procure the cases ready wired for long-distance transport.

Transport.

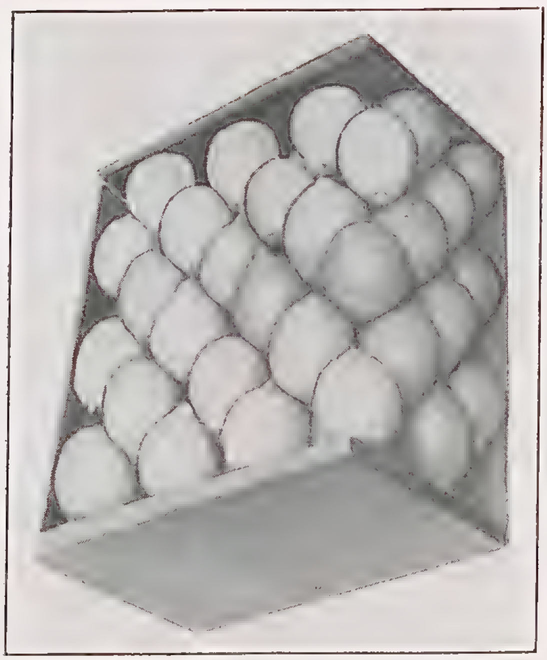
As the whole basis of successful marketing is care, growers should follow this principle right to the finish of their share of the handling. Remember, good packing, fancy labels, wiring, or stencilling will not sell bad fruit. All the care taken in putting up a first-grade, attractive package will be of no avail if growers, while carting the fruit to the station and loading into the trucks, do not handle it carefully. Too often we see carters sitting in the middle of packed cases of fruit while on the road. Even good packing will not stand abuse, so in closing I would urge every grower to handle his fruit from the tree to the rail or market as carefully as he would handle a basket of eggs.

2–2 Pack. 7 Layers.
First Layers.



2–2 Pack. 3 x 3 Layers. 7 Layers.

Finished Case.



2–2 Pack. 3 x 3 Layers. Total 84.

Plate 115 (Fig. 11).

BREEDING OF PEDIGREE DAIRY CATTLE.

By CHAS. McGRATH, Supervisor of Dairying.

THE effect of the financial stringency is being felt by breeders of pedigree dairy cattle. An opinion has been expressed by a few who do not come in contact with the activities of stud-masters that their business has been highly lucrative, an impression conveyed no doubt by the prices secured for a few individual sires bred on lines of blood noted for high production and purchased by breeders desiring to secure some coveted blood lines.

The most successful of breeders realised that there is little to enthuse over at the present time. All actively associated with breeding of stud stock also realise that it is becoming very difficult for breeders to carry on under the present conditions. It is further realised that the work of our stud-masters is an all-important factor in placing the dairy industry on an efficient foundation.

No dairy farmer can afford to ignore the value of breed for production sires. Pedigree is the foundation of all stock breeders' activities, and neglect of this fundamental factor leads to deterioration of our herds. An inferior herd of cattle is evidence of the lack of appreciation by its owner of the part that pedigree plays in the conduct of his business. A stockowner without the instinct of a breeder retards the progress of the industry he is engaged in.

The work of the pioneers in the breeding of pedigree dairy stock has never been fully appreciated at a fair value. Its worth to the dairy industry would be difficult to overestimate, and in the interests of the industry and the State every encouragement must be given so that the numbers of our pedigree herds shall not diminish.

In centres throughout the State where the dairying industry is established, there is evidence of the importance of the breeding of high-class dairy cattle in the improvement of dairy herds, thereby ensuring progress and stability of the industry.

It is heartening to know that the financial stringency has not effaced the instincts of many of our studmasters, or deterred them in their endeavours to further improve their herds by the introduction of high-class dairy stock from overseas. Such activity must have a very great influence on stud stock breeding, and in obtaining a general all-round improvement in the standard of the commercial dairy cattle of Queensland.

KAIRI SCHOOL OF INSTRUCTION FOR BOYS.

Mr. J. A. L. Sides, Hon. Secretary, Kairi Farm Boys' Camp, writes:—The School of Instruction for Boys at the Kairi State Farm has been brought to a most successful conclusion.

Fifty-five boys nominated to attend, but one of these was prevented from taking part owing to sickness.

Officers and boys entered into the spirit of the camp, and the keenness of the boys, both in competition and their desire to obtain knowledge, was a noteworthy feature. The instructors got right down to the boys' standard and led them along, the boys greatly assisting by asking questions as instruction proceeded. It was particularly pleasing to note how quickly the spirit of comradeship developed between instructors and boys, and after each lecture an eager group of boys would gather round the instructor—notebook in hand—hoping to obtain further information bearing on their own particular problems.

The course of instruction was most popular from start to finish, and all the boys are eagerly anticipating the next camp.

The value of the officers of your Department to the man on the land has been presented in a new light; and many parents have already stated that they had no idea such valuable information was available to them just for the trouble of asking. Your officers have been brought more directly into touch with the people, as a result of which their work will be easier, and the information they supply more eagerly applied.

We ask you to accept our sincerest thanks for the courteous and generous manner in which your Department supported this (our first) camp. We also wish to thank, through you, the officers of your Department whose services you made available to us, for the able and courteous manner in which they carried out their duties.

PLATE 116.—YOUNG FARMERS AT THE BRISBANE SHOW.

His Excellency the Governor, Sir John Goodwin, is seated in the centre of the group, which also includes members of the Council of the Royal National Agricultural and Industrial Association, and Departmental Officers. Ten of the boys represented Junior Farmers' Clubs of New South Wales, and with them were 25 Queensland club members.

PRODUCTION RECORDING.

List of cows officially tested by officers of the Department of Agriculture and Stock and which have qualified for entry into the Advanced Register of the Herd Book of The Australian Illawarra Shorthorn Society, The Jersey Cattle Society, and The Friesian Herd Book of Australia. The final tests of these cows were carried out during the months of July and August, 1931 (273 days' period unless otherwise stated).

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
		AUSTRALIAN ILLAWARRA SHORTHORN.		
Queenie 3rd of Pine View ..	Mature ..	11,667·75	409·768	Hickey and Sons, Wilston
Gift 5th of Yaralla	Mature ..	10,210·75	377·946	Hickey and Sons, Wilston
White Park Pet 11th	Senior (4 years)	11,414·75	407·383	W. T. Savage, Barnesmore
Gift 8th of Yaralla	Senior (4 years)	9,997·75	363·066	Hickey and Sons, Wilston
Mermaid 4th of White Park ..	Senior (4 years)	8,844·125	340·29	W. T. Savage, Barnesmore
Melba 6th of Rosemount ..	Senior (4 years)	8,153·45	333·478	A. J. Bryce, Maleny
Empress 9th of Rosemount ..	Junior (4 years)	12,619·75	508·604	C. O'Sullivan, Ascot Factory
Whitewings of Bellwood ..	Junior (4 years)	8,211·5	315·727	W. G. Currant, Gunalda
Flower 10th of Rosemount ..	Senior (3 years)	12,469·875	461·105	C. O'Sullivan, Ascot Factory
Eileen 6th of Rosemount ..	Senior (3 years)	10,565·875	393·537	C. O'Sullivan, Ascot Factory
Fancy 9th of Rosemount ..	Senior (3 years)	9,822·8	383·765	A. J. Bryce, Maleny
Jewel of Beechwood	Senior (3 years)	8,951·7	354·419	A. Marks, Atherton
Crumsie 3rd of Tula Stud (269 days)	Junior (5 years)	7,609·6	311·358	A. Marks, Atherton
Dolly 3rd of French View ..	Senior (2 years)	7,946·75	332·324	W. J. Barnes, Cedar Grove
Scarlet 13th of Springdale ..	Senior (2 years)	8,101·5	327·231	E. Lightbody, Pimpama
Peggy 2nd of Glenrock ..	Senior (2 years)	8,716·625	314·335	A. Kamholtz, Nerang
Elsie 3rd of Kingsdale ..	Senior (2 years)	7,178·2	282·77	A. A. King, Mooloolah
Foremost 3rd of Blackland ..	Junior (2 years)	9,903·008	355·155	A. Pickels, Wondai
Model of Aurora	Junior (2 years)	7,345·5	295·972	R. Eichmann, Mundubbera
Princess 2nd of Trevor Hill ..	Junior (2 years)	7,776·15	284·668	G. Gwynne, Southbrook
Princess 7th of Kingsdale ..	Junior (2 years)	6,388·2	259·475	A. A. King, Mooloolah
Diamond 3rd of Headlands ..	Junior (2 years)	6,374·866	257·628	G. Heading, Murgon
Beauty 5th of Rhodesview ..	Junior (2 years)	6,903·779	255·934	W. Gierkie and Sons, Helidon
		JERSEYS.		
Lindley Lady Prim	Mature ..	8,541·75	476·462	A. Bulow, Mulgeldie
Mascot's Girlie of Burnleigh ..	Junior (4 years)	8,035·0	427·67	F. T. Teske, Nambour
Treasure of Burnleigh (259 days)	Junior (4 years)	6,620·05	324·525	W. W. Mallett, Nambour
Joy of Woodstock	Junior (4 years)	5,986·375	315·218	P. C. Henman and Sons, Mudgeeraba
Prospect Dewdrop 16th ..	Senior (3 years)	7,123·5	378·757	E. L. Melville, Toogoolawah
Glengarriffe Nobles Langtry 2nd	Senior (3 years)	5,597·7	311·111	C. E. C. F. Young, Imbil
May 3rd of Grasmere	Senior (3 years)	5,744·95	294·593	A. Dawson, Malanda
Floss 23rd of Grasmere ..	Junior (3 years)	6,072·8	314·216	A. Dawson, Malanda
Trinity Tinklebell (210 days)..	Junior (3 years)	5,184·0	271·441	J. Sinnamon, Goodna
Calm 4th of Grasmere ..	Senior (2 years)	5,174·5	287·848	A. Dawson, Malanda
Prides Crystal of Burnleigh (365 days)	Junior (2 years)	8,087·5	436·693	W. W. Mallett, Nambour
Silver Star of Hazeldean ..	Junior (2 years)	6,289·25	353·658	A. Bulow, Mulgeldie
Burrawong Lady Linda ..	Junior (2 years)	6,462·55	320·105	R. J. Bott, Yandina
Majesty's Joyce of Brooklands	Junior (2 years)	5,580·759	313·690	J. Williams, Wondai
Eva of Brooklodge	Junior (2 years)	5,831·15	289·994	J. Teske, Nambour
Nan 3rd of Woodlands ..	Junior (2 years)	5,850·25	259·44	D. R. Hutton, Cunningham
Lustre of Lisieux	Junior (2 years)	4,353·5	242·023	J. Williams, Wondai
Trecarne Ettna	Junior (2 years)	4,116·958	240·973	T. A. Petherick, Lockyer
Dewdrop 3rd of Golden Hill ..	Junior (2 years)	3,766·5	232·868	C. F. Klause, Mundubbera
		FRIESIAN.		
College Pontiac Princess (365 days)	Mature ..	24,158·75	816·995	Hickey and Sons, Wilston
Holly Hock 2nd of Oaklands..	Mature ..	11,629·969	416·303	W. Richter, Tingoora
Holy Hock 2nd of St. Athan..	Mature ..	10,964·758	413·792	W. Richter, Tingoora
Beauty of Oaklands	Mature ..	9,061·535	406·496	W. Richter, Tingoora
Dairymaid of Oaklands ..	Mature ..	10,794·875	206·101	W. Richter, Tingoora
Pet 2nd of Oaklands	Mature ..	10,961·818	384·552	W. Richter, Tingoora
St. Athan Bee (365 days) ..	Senior (2 years)	18,008·229	564·498	W. Newman, Wyreema
St. Athan Doe	Junior (2 years)	11,014·4	355·01	W. Newman, Wyreema
Rosey Rock of Oaklands ..	Junior (2 years)	7,031·036	285·658	W. Richter, Tingoora
Holly 3rd of Oaklands ..	Junior (2 years)	7,602·996	282·554	W. Richter, Tingoora

CO-OPERATION APPLIED TO THE POULTRY INDUSTRY.

By C. KIDD.

The story of the progress of the Poultry Farmers' Co-operative Society has been well described as a romance of industry. The society is an example of pure co-operation, a happy combination of the ideal and the real made possible by men of vision, energy, and practical business sense working unselfishly in a common cause. Mr. Kidd is a well-known leader in the poultry industry, and his account of the development of its commercial side will be read with interest by all concerned in the success of practical co-operation in primary industry.—Ed.

THE story of the progress of the Poultry Farmers' Co-operative Society has been referred to as a "romance of industry," and indeed its growth in ten short years cannot be described in any other terms.

It is the outcome of an ideal—the desire to mutually assist in the organisation and betterment of the poultry industry in this State—and practical minds have translated the ideal into a tangible realisation.

The poultry industry, perhaps more than any other, was in need of organisation. It was producing considerable wealth for the State, but its several units had been so diffusing their energy that the true value of their collective efforts had not been realised nor the possibilities of the industry visualised by the average citizen.

Poultry-raising is an industry requiring the application of business methods, and profits per bird being very small it is essential to make every possible saving in production costs to show a satisfactory return.

The National Utility Poultry Breeders' Association has consistently championed the cause of the poultrymen, and it is due to the enterprise and enthusiasm of its members that the organisation now known as the Poultry Farmers' Co-operative Society was established in 1921.

Many of the members were not dependent on poultry-raising for a living, but had become associated with poultrymen through a lively interest, as amateurs, in the industry. They were quick to appreciate the difficulties under which poultrymen were struggling, and realising what a valuable place poultry farming might and should occupy in the State's agricultural operations, conceived the idea of promoting this co-operative organisation to purchase and distribute foodstuffs, these being the most expensive items in the business of poultry-raising. They recognised that co-operative principles would ensure honest trading, pure and high quality goods, and a saving of money by reducing the distributing cost of poultry foods. Further, *it ensured that any profits resulting from the undertaking would remain in the industry.*

Education in Co-operation.

The society is something more than a trading concern. It has an intimate knowledge of the requirements of its customers and, in addition to providing a service in regard to delivery which was previously unknown, it disseminates knowledge on poultry culture and offers free advice on any subject bearing on the industry, both verbally and by means of printed pamphlets. It is difficult to assess the value of the service the society has rendered to the industry, and it has been instrumental in lightening the poultryman's burden considerably by securing reductions in freight charges and improving generally the status of the industry, irrespective of the great saving in prices which have resulted from the combined operations of its members.

Apart from the small annual dividend on the capital invested, the whole of the profits of the society are distributed each year among members as a bonus on purchases, or used in the business for the creation of further benefits. In this way more than £11,000 has been returned to the society's customers during the past two years.

The Progress of the Society.

The society has just celebrated its tenth birthday, having been established in July, 1921, when there were eighty-five members, who contributed a total share capital of £514. The present membership is 800, and the share capital exceeds £4,000.

In July, 1921, 8 tons of bran and pollard were purchased by the society's members. The present output is more than fifty times greater, being over 5,000 tons, or 500,000 bushels annually. In addition, over 100,000 bushels of wheat are used as grain, besides huge quantities of maize, barley, oats, and other cereals.

PLATE 117.—EXECUTIVE ON THE POULTRY FARMERS' CO-OPERATIVE SOCIETY.

Left to Right.—Messrs. R. H. Woodcock, Manager; W. H. Campbell, Director; S. Lloyd, Chairman of Directors, A. S. Walters, Director; C. Kidd, Secretary.

The first store secured for the society's business was in the basement of a bulk store in Little Roma street. Mr. Woodcock, the present manager, combined the duties of director, manager, secretary, storeman, and clerk.

Trans-Marine Trade.

The society, in 1923, exported 35,000 dozen eggs to England, and in so doing made history, for it was the first occasion on which a co-operative or poultrymen's organisation had shipped Queensland eggs overseas.

The growth of the business is best shown by the following figures:—Turnover for eighteen months ending 31st December, 1922, £20,217. For year 1923, £12,276; 1924, £12,430; 1925, £22,166; 1926, £41,993; 1927, £57,760; 1928, £83,472; 1929, £109,075; 1930, £104,240.

The society, in October, 924, manufactured the first bag of "Red Comb" laying mash, and in so doing launched a new industry for the State. Prior to that date all manufactured balanced poultry foods were imported. This branch of the business has grown rapidly, and new plant has just been installed, with a capacity of 500 bags daily.

So successful have been the results that the society is now turning out "Red Comb" dairy food, calf food, and pig food, and these give every indication of becoming as popular as the other "Red Comb" products.

Apart from the large sums paid to members as bonus on purchases, the society has saved the industry tens of thousands of pounds in the first cost of the articles sold. It has created a healthy competition to the advantage of its members and the industry generally.

Huge purchases on a co-operative basis are a benefit to farmers dealing from the society, and low overhead and working expenses have permitted profits to be made, notwithstanding the small margin over cost which the management allows. These profits, instead of being used for private gain, are retained in the industry.

THE MANUFACTURE OF POULTRY FOODS.

Recently the Hon. Harry F. Walker, Minister for Agriculture and Stock, performed the opening ceremony in connection with new units of machinery installed at the society's headquarters, Red Comb House, Brisbane.

The additions consist of a pulveriser for reducing lucerne chaff and whole grain to meals, and an automatic mixing machine for measuring and mixing the various constituents of balanced poultry and stock foods.

The pulveriser is fitted with steel beaters which rotate at the rate of 2,900 revolutions per minute, and which reduce the lucerne or grain to a fine meal. This is then elevated to the upper floor and discharged through shoots, either into bags for sale or diverted into one of the hoppers connected with the mixing plant. The latter consists of a series of hoppers each intended to carry one of the ingredients to be mixed. These hoppers are filled to capacity. They discharge at the bottom, the flow being governed by the speed of a worm drive which is fitted with a micrometer adjustment so that a few ounces or several pounds of a given commodity can be delivered in a stated period. Once the machines have been adjusted, the whole of the operation of weighing out and mixing the ten or eleven different elements of the prepared foods is done automatically.

A worm conveyor running the full length of the rows of hoppers receives the discharge from the latter, and in transit the meals are thoroughly mixed before being delivered, several minutes afterwards, into another conveyor, where they join the bran and pollard and cod liver oil. They then proceed to be mixed in another 17-feet conveyor, and finally elevated and discharged into the waiting bags by automatic packers.

The arrangement of the plant enables lucerne chaff and whole grains to be fed to the machines, and they are untouched by hand until delivered as complete balanced foods.

The plant also includes a roller mill fitted with two pairs of 40-inch rollers 10 inches in diameter. This is used for rolling oats, cracking corn, and also for making fine meals. Its capacity when cracking maize is 230 bushels per hour. Used in conjunction with another series of hoppers and emptied by "shoe" mixers into a worm conveyor, this machine also manufactures the well-known "Red Comb" chick food. A dressing reel, a machine fitted with rotary sieves, is used for removing any husks, and its operation ensures the purity and even quality which is characteristic of all "Red Comb" products.

The Poultry Farmers' Co-operative Society may be described fittingly as a working model of true co-operation in which the best and most economic service is ensured to its members, and team work, combined with sound business management, are the main factors in its success. It is an excellent example of the interlocking of primary and secondary industry under producer-consumer control.

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Carpet Grass.

J.O.J. (Glasshouse Mountains)—

The grass is *Axonopus compressus* (Syn. *Paspalum compressum*), the Carpet Grass, and one that has been boomed a good deal as a fodder, but of which one receives varying reports. On certain classes of country, particularly some of the damp sandy land inclined to be swampy, such as where you have it growing and where better class grasses such as ordinary Paspalum and Rhodes will not thrive, it would seem to have considerable value.

Carpet Grass.

C.O. (Kin Kin)—

Paspalum compressum, or Carpet Grass, is suitable for growing on poorer class coastal soils unsuited for the growing of ordinary Paspalum or of Rhodes. In the better-class country it should, where possible, be eradicated from pastures. On the subject of a suitable spray, Mr. Brünnich, Agricultural Chemist, advises as follows:—"The weedicide, Sodium chlorate, may be used, as it is only slightly poisonous as compared with arsenic, and as it is sprayed on very lightly it is not likely that stock would consume sufficient sprayed grass to do any harm. If containers or bags with the poison are left about, it may, on account of its salty taste, be consumed in sufficient quantity to be fatal. A.C.F. & Shirley's Fertilizers sell this weedicide, and also a new preparation, chiefly lime chlorate, which is less liable to cause fire on the dried weeds or cloth, &c."

Native Bryony.

T.B. (Silkwood)—

The specimen is the Native Bryony (*Bryonia laciniosa*), a plant poisonous to stock. The berries have rather a nauseating taste, but nevertheless they have been eaten by children at odd times, causing severe illness, though we do not know that death in any case has actually followed. This plant generally disappears after the land has been brushed and cleared, as it is one that naturally grows among bushes or over fallen logs and among weeds in newly-burnt scrub. As the plant disappears with the opening up of the land, and putting it under grass, no particular trouble regarding its eradication is generally taken by farmers, but the Agricultural Chemist has been asked to send you a spray non-poisonous to animals that you might use if you so desire.

"Native Rhodes Grass."

T.C. (Gladstone)—

Your specimen is *Chloris virgata*, sometimes called Native Rhodes Grass. We do not think that seed is, as a general rule, stocked by nurserymen, but once it becomes established it seeds very abundantly and spreads itself naturally. If you prefer, seed can be gathered and sown in the same way as Rhodes grass. The plant is very closely allied to Rhodes grass, but, generally speaking, is not regarded as having so much value as a fodder.

Ellangowan Poison Bush.

F.R.D. (Barcaldine)—

The plant is *Myoporum deserti*, commonly known as the Ellangowan Poison Bush. It belongs to a dangerous family, and has been accused of poisoning stock in Queensland and New South Wales at different times. No actual feeding tests, so far as we know, have been carried out on the plant, but the symptoms that have been given in some previous cases agree closely with yours, and it is quite likely that under the circumstances this plant is the cause of the trouble.

A Doubtful Fodder Plant.

T.V. (Kairi, N.Q.)—

The specimen is *Phaseolus semi-erectus*, a native of tropical America, now a naturalised weed in most tropical and subtropical countries. It was introduced into Australia many years ago as a fodder, but our experience has been that stock rarely touch it, or at least not to any extent. The plant has been grown quite successfully in some places as a green manure, and is not known to possess any poisonous properties.

A Lichen.

A. McL. (Springsure)—

The specimen is not a Fungus, but is a Lichen. We cannot give you the specific name, as that would be the work of a specialist. However, we suppose it is in the plants as a whole that you are more particularly interested. Lichens are plants composed of the interlacing roots of a fungus, among which are found the cells of fresh water Algæ, the peculiar colouration being due to a combination of the two components. This combination also allows lichens to grow where neither the fungus nor the alga could live alone, such as bare rocks, tree barks, dry ground, and so forth. As a whole, lichens are much more abundant in colder places than in the tropics and subtropics; for instance, in Queensland our largest lichens grow in the colder parts of the State, such as the higher parts of the MacPherson Range, where there is abundant moisture. As a general rule, they are plants of no particular economical importance, except that in northern latitudes one of the species, the so-called Reindeer Moss, serves as food for reindeer and caribou.

Poinciana Bloom.

Querist (Brisbane)—

Poinciana trees growing vigorously and in good soil generally take longer before they reach the flowering period than trees of a more stunted nature growing in poorer soil. These latter generally start flowering when about seven or eight years old, but more vigorous growing trees are commonly over ten years old before they commence to flower.

"Headache Vine."

Inquirer (Brisbane)—

The specimen collected at Imbil is *Clematis glycinoides*, the Native Clematis or Headache Vine. The name Headache Vine arises from the fact that if the fresh leaves are crushed up in the hand, and the odour inhaled very strongly, the eyes and nose run, and headaches are said to be cured.

A Native Fodder Plant.

Mr. Fred. Tinsley, Crown Lands Ranger, Charters Towers, writes under date of 2nd July as follows:—

"When recently on a tour of inspection on the basalt tableland country which comprises the Lolworth Expired Pastoral Holding and Grazing Farms Nos. 96, 189, 223, and Preferential Pastoral Holdings Cuba and Bubbling Springs, I came across a weed, a sample of which I am herewith sending you. This weed is causing some interest on that part of my district, for the reason that it is eagerly sought after by all classes of stock. From inquiries I find that the weed enclosed is a new growth, and only made its appearance on the tableland this year, and in view of this circumstance the settlers up there asked me to write you and ascertain the name of it. I am herewith asking to be supplied with the name and also if it is an old weed."

The weed forwarded by Mr. Tinsley is *Lotus australis*, the Native Birdsfoot Trefoil, undoubtedly a very valuable forage plant relished by all classes of stock. Unfortunately, it contains, like the Sorghums and some other valuable fodders, a prussic-acid-yielding glucoside, and in consequence deaths from eating it have been reported at odd times. Most of those plants with a prussic-acid-yielding glucoside seem to affect hungry travelling stock that come on to them on an empty stomach more than they do ordinary paddocked animals. The Fuchsia Bush (*Eremophila maculata*) is a case in point.

General Notes.

Official Purebred Tests.

Included in the list of cows that completed their long-distance test during the months of July and August, 1931, and qualified for entry into the Advanced Register of their respective Herd Books are representatives of the herds of many of our leading breeders of dairy cattle.

With a yield of 508.604 lb. butter fat in 273 days, Empress 9th of Rosemount, an A.I.S. junior 4-year cow owned by Mr. C. O'Sullivan, of Ascot, Darling Downs, is at the head of the list, followed by Lindley Lady Prim, a Jersey mature cow owned by Mr. A. Bulow, of Mulgeldie, which produced 476.462 lb. of fat in 273 days. With a yield of 816.995 lb. of fat in 365 days, College Pontiac Princess, a Friesian mature cow, the property of Hickey and Sons, Wilston, heads the list, St. Athan Bee, a senior 2-year old Friesian, gaining second place with a yield of 564.498 lb. of fat in 365 days.

Australian Oranges the Best.

"They were considered to be the best oranges that Canada has ever imported, and contained more juice than any that had ever come to Vancouver."

This eulogistic report has been received by the Murrabit Packing Company Proprietary, Ltd., Victoria, from its agent in Vancouver on a shipment of 200 cases of naval oranges packed by it and forwarded by the Aorangi, which left Sydney on 23rd July last.

The report says that the consignment arrived in perfect condition, as if freshly picked from the trees. The agent arranged to display and sell the whole consignment at the Vancouver Canadian-Pacific Show. Various offers to sell fruit were received, including one from the Hudson's Bay Company.

Tests for weight made with ten cases of the Murrabit oranges and ten cases of other brands showed 10 lb. a case in favour of the Murrabit fruit.

Miss Laverock, M.A., a culinary and dieting expert, stated that the consignment was superior to any oranges that she had tasted from California, Florida, or Spain.

The Control of Cabbage Pests.

The Minister for Agriculture and Stock (Mr. H. F. Walker) made reference recently to the fact that the control of cabbage pests, particularly leaf-eating caterpillars, had been engaging the attention of the Department during the last few months. Such attention was necessitated by the fact that arsenate of lead had in recent years been used by a number of cabbage-growers during the later stages of the growth of the cabbages. This practice had led to large condemnations of cabbages, and had also prejudiced consumers against the use of that vegetable.

Experiments conducted last summer by the Departmental entomologist at Stanthorpe, in co-operation with a local grower, had yielded a satisfactory degree of control by the use of a derris product. This result was obtained in a season during which cabbage caterpillars were abnormally abundant.

Mr. Walker added that arrangements are being made by his Department for the carrying out of further field experiments on the control of cabbage pests during the spring and summer months of this year. These experiments will be conducted at Stanthorpe and in the vicinity of Brisbane, and are intended to definitely determine what sprays, other than arsenical and similarly undesirable chemicals, will yield a satisfactory degree of control on an economically sound basis. Among the sprays to be tested are pyrethrum and derris products and kerosene emulsion.

It would seem that the class of sprays just mentioned offers the best prospects of success in the search for an alternative to arsenate of lead. It must be remembered, however, that any spray, to be successful, should be applied in the early stages of growth. Too frequently spraying is neglected until the later stages, by which time the infestation has reached very serious proportions. In addition to spraying, some measure of assistance in control may be obtained by strict attention to farm hygiene, which includes the destruction of unmarketable cabbages and any other débris on which the caterpillars can breed.

Pineapple Levy Regulations.

The Governor in Council has approved of the issue of Regulations under the Fruit Marketing Organisation Acts empowering the Committee of Direction of Fruit Marketing to make a levy on all pineapples marketed for the twelve months beginning on 17th September, 1931, and ending on 16th September, 1932.

These Regulations are similar to those which were in force last year, except that they differentiate between Ripley and rough pineapples and smooth-leaf pineapples sold on the market, the same charge being on all varieties going forward to canneries.

For smooth-leaf pineapples the levy shall be at the rate of 2d. per case of pineapples in containers; and when sold loose, at the rate of 2d. for every 24. For rough and Ripley varieties the levy shall be ½d. per case; and when sold loose, at the rate of ½d. for 42. For all varieties sent to canneries, the levy shall be 2½d. per case of pineapples with "tops on," or 3½d. with "tops off."

Part of the sums raised by the levy shall be used to meet any loss, if any, on processed pineapple products processed in Queensland with the authority of the Committee of Direction or exported overseas, and the balance shall be expended in the interests of the pineapple industry.

Definition of Cotton-Grower.

The Governor in Council has approved of the issue of an Order in Council under the Primary Producers' Organisation and Marketing Acts amending the constitution of the Cotton Board in respect of the definition of a cotton-grower.

The amended definition now provides that the class of persons who shall be deemed to be growers and eligible to vote on any referendum or election in connection with the Cotton Board shall be those who, during the twelve months immediately preceding the referendum or election, delivered to ginneries seed cotton which was grown by them on land of which they were owners or tenants, or who, at the time of the referendum or election, have growing not less than one acre of cotton on land of which they are owners or tenants.

Canary Seed Board Hail Insurance Scheme.

The Governor in Council has approved of the issue of Regulations under the Primary Producers' Organisation and Marketing Acts which provide for a hail insurance scheme by the Canary Seed Board.

The Regulations provide that the Canary Seed Board shall establish a Hail Insurance Fund for the purpose of paying to canary seed growers compensation in respect of losses sustained to crops through hailstorm damage, and for defraying the costs incidental thereto.

The fund shall be created by a levy in the form of a *pro rata* premium charge against growers calculated on the basis of the quantity of canary seed harvested and that on which hail insurance compensation is payable each year, and this fund shall be known as the Canary Seed Board Hail Insurance Compensation Fund.

The levy shall be a charge against the grower, and may be deducted from advances, but the sum chargeable in any one year shall not exceed 7½ per cent. of the total value of the seed insured during the same year. All seed shall be covered from the time it is out in ear until harvested, but such cover shall not extend beyond the 31st January in any year.

Every grower shall carry his own risk to the extent of the first 5 per cent. of the crop on the area damaged on each plot.

The Board may appoint assessors to assess losses.

Provision is made in the Regulations that at least fifty growers who, during the last twelve months, have harvested for sale canary seed produced in the State may make, in writing to the Minister, on or before the 19th October, 1931, a request for a poll of all growers on the question of the levy proposed to be made. Such poll shall be held by the Under Secretary, Department of Agriculture and Stock, Brisbane, if a petition, as above, is lodged before the date specified. If such poll should be unfavourable, the levy will not be made.

Caloundra a Sanctuary.

The township of Caloundra has been declared a sanctuary under the Animals and Birds Acts, in which it shall be unlawful for any person to take or kill any animal or bird.

A Sanctuary at Inkerman.

The Inkerman Irrigation Area has been declared a sanctuary under the Animals and Birds Acts, in which it shall be unlawful for any person to take or kill any animal or bird.

Honey Board.

The Governor in Council has approved of the issue of a Regulation under "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1930," extending for a further twelve months the Honey Board Levy Regulations which were approved on the 21st August, 1930, and which empower the Honey Board to make a levy on growers of honey and beeswax at the rate of 1½ per cent. on all honey and beeswax sold during the period of the existence of the Regulations, to provide for the administrative expenses of the Board.

Returning of Whey to Farm.

The pasteurisation of whey at the factory is essential and is compulsory under the Dairy Produce Act. Unless the whey tanks at the factory are thoroughly cleansed daily, they become a contributory factor in the deterioration of some milk supplies. When the whey is returned in the milk cans it is essential in the interests of the industry that the cans be emptied of the whey immediately on return to the farm, and that they be thoroughly washed and scalded with boiling water and left to drain and air.

The Broom Millet Board.

The Governor in Council has approved of the issue of an Order in Council under the Primary Producers' Organisation and Marketing Acts, giving notice of intention to extend the operations of the Broom Millet Board for a further period of three years from the 1st November, 1931, to the 31st October, 1934. The Board was first constituted in March, 1926, and extended in March, 1929. The present Board's term will expire on the 31st October next.

The Order in Council makes provision for a petition signed by not less than 10 per cent. of the growers of broom millet to be lodged on or before the 12th October next, requesting that a ballot be conducted to decide whether or not the Board shall continue to function for the extended term abovementioned.

Nominations will also be received for the election of two growers' representatives, and such nominations must be signed by at least five persons who have grown broom millet for sale since 30th October, 1930.

Tomatoes and the Committee of Direction of Fruit Marketing.

A regulation was issued recently under the Fruit Marketing Organisation Acts, empowering the Committee of Direction of Fruit Marketing to conduct a ballot of tomato growers to decide whether or not the Committee of Direction should acquire all tomatoes grown in certain specified districts in Southern Queensland.

The ballot, which closed on the 31st August, resulted in 68.9 per cent. of the votes polled being in favour of the acquisition, and the Governor in Council has approved of the issue of an Order in Council, declaring that the whole of the tomatoes produced in the Petty Sessions Districts of Maroochy, Caboolture, Esk, Woodford, Kilcoy, Redcliffe, Brisbane, Cleveland, Southport, Logan, Beaudesert, Wynnum, Goodna, Ipswich, Marburg, Laidley, Lowood, Harrisville, Dugandan, and Rosewood shall be acquired by the Committee of Direction of Fruit Marketing for the period from the 15th September, 1931, to the 15th December, 1931.

The present acquisition has been sought by the Committee of Direction for a similar purpose to the acquisition of last year. The object is to restrict or prohibit the forwarding of immature or blight-affected tomatoes to the Southern markets.

Canegrowers' Council—Amended Regulation.

The Governor in Council has approved of the issue of Regulations under "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1930," amending "The Queensland Cane Growers' Council Regulations of 1931," which were approved on the 13th August, 1931, and which provide for the conduct of meetings of the Queensland Cane Growers' Council, District Cane Growers' Executives, Mill Suppliers' Committees, and also the business of the Annual Conference of the Sugar Industry.

The amendments to the above include a slight alteration of Regulation No. 330, and also the addition of two new Regulations Nos. 328A and 355A.

Staff Changes and Appointments.

Constable T. C. D. Monaghan, of Goomeri, has been appointed also an inspector under "*The Slaughtering Act of* 1898."

The Officers in Charge of Police at Caboolture, Canungra, Coomera, Gatton, Harrisville, Helidon, Kilcoy, Moore, Nerang, and Yarraman have been appointed also Acting Inspectors of Stock as from the 29th August, 1931.

Messrs. W. J. James, S. K. Short, and W. Jones, of the Townsville Gun Club, have been appointed Honorary Rangers under "*The Animals and Birds Acts,* 1921 *to* 1924."

Mr. John R. MacGregor, Cairns, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Miss S. Wilkinson has been appointed an Assistant Cane Tester at the Moreton Mill for the forthcoming sugar season.

Mr. Sydney Schmidt, Island Plantation, via Maryborough, has been appointed an Honorary Ranger under the Native Plants Protection Act.

The following members of the Committee of the National Parks Association of Queensland have been appointed Honorary Rangers under the Native Plants Protection Act:—Messrs. R. W. Lahey, M. P. M. Campbell, G. H. Barker, A. Groom, J. E. Young, J. Nebe, J. A. Watson, C. Kemp, H. L. O'Reilly, A. B. O'Reilly, Professor E. J. Goddard, D.Sc., and Dr. E. O. Marks; Misses W. Moore and D. F. King, and Mrs. W. M. Mayo.

Valedictory—Mr. J. C. Brunnich, F.I.C., F.C.S., F.A.C.I.

Mr. J. C. Brünnich, on the occasion of his retirement from the position of Agricultural Chemist, Department of Agriculture and Stock, was presented with a wallet of notes by the Minister for Agriculture (Mr. Harry F. Walker) on behalf of the staff of the Department.

The Minister said that Mr. Brünnich had served thirty-five years with the Department. No man was looked upon with greater respect and confidence. The service that he had given to the whole of Queensland was an example that could well be followed. No man in the Department had given better service. On account of his wide knowledge, Mr. Brünnich was probably the greatest authority on his subject in Australia. He had been particularly pleased with Mr. Brünnich's administration of his branch.

Other speakers referred to the establishment by Mr. Brünnich of what they considered to be the finest agricultural laboratory in Australia, the proficiency of the men whom he trained, and his work for the sugar industry.

Mr. Brünnich, who was greatly affected by the demonstration of his colleagues' esteem, expressed his heartfelt regret at leaving the Department and the laboratory he loved, and which he regarded as his child. He said that he was sorry that some of his recommendations had been lost, for various reasons, and that some of the work done had remained hidden. He felt his severance from the service, which had been made necessary by the inexorable passage of time, very keenly; and would carry with him into retirement many happy memories of the Department and of his associates who were doing work of immeasurable value for both the State and Commonwealth.

Mr. Brünnich was subsequently entertained by a number of immediate friends and former students at a dinner party at the Carlton Cabaret. Mr. E. H. Gurney presided, and those present were Messrs. A. B. Chater, T. McCall, F. Connah, C. H. O'Brien, W. G. McKechnie, L. A. Meston, A. Hurwood, G. R. Patten, F. Bennett, W. Cartmill, W. Winks, N. Cassidy, A. Webb, J. MacGibbon, F. Barry-Smith, C. R. von Stieglitz, O. Kent, Dr. H. W. Kerr, and Dr. K. Brünnich.

Protection of Native Plants.

"*The Native Plants Protection Act of* 1930" was passed last session, and is designed to prevent the wholesale destruction of our native plants, ferns, and orchids. A Proclamation has been issued declaring that the provisions of this Act shall come into force on the 18th July, 1931, and Orders in Council have been approved which provide that the whole of the State of Queensland shall be a district for the purposes of the Act, and that the following native plants shall be protected throughout Queensland:—

Botanical Name.	Vernacular Name.
FERNS.	
Alsophila australis	Tree Fern
Alsophila excelsa	Tall Tree Fern
Alsophila Leichhardtiana	Prickly Tree Fern
Alsophila Robertsoniana	Robertson's Tree Fern
Alsophila Rebeccæ	Broad-leaved Tree Fern
Alsophila Baileyana	Wig Tree Fern
Dicksonia antarcitica	Mountain Tree Fern
Dicksonia Youngiæ	Young's Tree Fern
Davallia pyxidata	Hare's Foot Fern
Adiantum æthiopicum	Common Maiden Hair Fern
Adiantum hispidulum	Five-fingered Maiden Hair
Adiantum formosum	Scrub Maiden Hair Fern
Asplenium nidus	Birds' Nest Fern
Asplenium simplicifrons	Narrow-leaved Birds' Nest Fern
Platycerium grande	Stag Horn Fern
Platycerium alcicorne	Elk Horn Fern
PALMS.	
Archontophœnix alexandre	Northern Piccabean
Archontophœnix Cunninghamii	Southern Piccabean
Bacularla monostachya	Walking Stick Palm
Licuala Muelleri	Fan Palm
Livistona australis	Cabbage-tree Palm
Drymophlceus Normanbyi	Black Palm
ORCHIDS.	
Dendrobium bigibbum	Purple Orchid
Dendrobium phalænopsis	Large Purple Orchid
Dendrobium superbiens	Torres Strait Orchid
Dendrobium undulatum	Curly Orchid
Dendrobium speciosum	King Orchid or Rock Lily
Dendrobium fusiforme	..
Dendrobium delicatum	..
Dendrobium tetragonum	Spider Orchid
Dendrobium æmulum	Box-tree Orchid
Dendrobium Kingianum	..
Dendrobium gracilicaule	Slender Orchid
Dendrobium canaliculatum	Tea Tree Orchid
Dendrobium linguiforme	Tongue Orchid
Dendrobium teretifolium	Pencil Orchid
Dendrobium Beckleri	Small Pencil Orchid
Phaius grandifolius	Common Phaius
Phaius Bernaysii	Yellow Phaius
Calanthe veratrifolia	Scrub Lily
Cymbidium canaliculatum	Arrowroot Orchid
Cymbidium albusiflorum	Long-leaved Arrowroot Orchid
Cymbidium suave	Slender Arrowroot Orchid
Sarcochilus Hartmanni	..
Sarcochilus Fitzgeraldi	..
MISCELLANEOUS PLANTS.	
Hoya australis	Hoya or Wax Flower
Cordyline terminalis	Palm Lily
Lycopodium phlegmaria	Tassel Fern

The effect of the protection is that it will be unlawful to pick a protected native plant which is growing on any Crown land or State forest or National park, or any public park dedicated for public purposes, or on any private land without the permission of the owner of such land.

It will further be an offence to sell a protected native plant unless it can be proved that such protected plant was grown on private land and was taken with the permission of the owner.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

RECENT RESEARCH ON VITAMINS.

Our ideas as to the nature and value of vitamins are changing. We no longer regard them as mysterious, or perhaps unreal, substances of unknown chemical composition. Nor do we any longer think of them exclusively as substances whose total absence from our food leads to a few peculiar diseases such as rickets, scurvy, beri-beri, and pellagra. Our ideas have become more definite and also broader. We have become more concerned about relative deficiency of all the vitamins, which is a very common and series condition, rather than about the absolute deficiency of any one of them, which is comparatively rare.

A Life and Death Difference.

The chemical composition of vitamin D is rapidly becoming known. This vitamin can now be manufactured in any desired quantity, and has even been prepared in pure crystals. Research into the chemistry of the other vitamins is not yet so advanced, but recent work on vitamins A and B gives much promise of similar success. In another direction an even more important advance has been made. We are all of us continually subject to the attacks, in varying intensity, of the disease germs which cause influenza, suppuration, pneumonia, consumption and many other diseases. Yet we do not all catch those diseases, and of those who do catch them, some get them in a mild form and soon recover; others suffer severely and may die. Human beings are more or less resistant to infectious diseases. The nature of this resistance is still imperfectly understood, but we know that it is partly due to the formation in the body of chemical substances, which we call antibodies. It has now been proved that one very important factor in the establishment of resistance to disease is the presence of an adequate supply of vitamins in the diet. This is surely a discovery of great importance. Vitamins may make the differeince between good health and bad health, and often between life and death.

This truth has lately been made very clear by a long series of experiments carried out in India by a distinguished scientist named McCarrison. Some 1,000 white rats were kept under ideal sanitary conditions until they were two years old (which would correspond to about 45 or 50 in the human being). They were fed on a diet similar to that eaten by certain peoples of Northern India, among whom some of the finest physical specimens of mankind are to be found. It consisted of whole wheat flour, unleavened bread lightly smeared with fresh butter, sprouted peas, fresh raw carrots and cabbage, fresh milk, a small ration of raw meat with bones once a week, and plenty of water. For over two years there was no case of illness and no death among these 1,000 rats. The most careful post mortem examinations showed them to be remarkably free from disease. They had large litters, the average being eight, but often twelve or fifteen, and the mothers invariably reared the whole of their young.

Side by side with these were shelters containing several thousand white rats under equally ideal sanitary conditions, but fed on various deficient diets. Of all faulty diets used, that composed of white bread, margarine, tea, sugar, jam, preserved meat, and scanty over-cooked vegetables—a diet in common use in England and in Australia (except that we use butter instead of margarine)—proved to be one of the worst. These rats suffered from a multitude of diseases. We can name some only—pnuemonia, sinus disease, pus in the middle ear, adenoids, eye diseases, gastric ulcer, enteritis, stone in the kidney and bladder, premature births and still-births, abscesses, anaemia, inflamed glands, goitre, neuritis, heart disease. It was conclusively proved that a diet poor in animal fats, milk, and fresh vegetables will induce in rats a host of diseases well known to afflict human beings.

Vitamin Content of Common Foods.

Is it conceivable that these results have no application to human beings? Surely our population, with its large percentage of rejects for military service and its numerous hospitals filled with these very diseases, might learn some lesson from it. So might our mothers, for though vitamins are necessary at all ages, during infancy and childhood they are necessary for development as well as health.

Let me enumerate our common foods which contain no vitamins. They are butcher's meat, canned meat, bacon, dripping, white bread, white flour, biscuits (except granose and shredded wheat made with whole grains), rice, tapioca, sago, cornflour, sugar, jam, tea. We do not say that these foods should not be eaten in moderation; but those who try to live on them exclusively will not live healthy, and are not likely to live long. Only when taken together with a liberal supply of food containing vitamins are they wholesome.

The most important vitamin-containing foods are milk, butter, cheese, eggs, green vegetables (if cooked rightly—they must not be boiled long nor with soda, nor should more water be used than necessary; if any drains away it should be taken in soup, for it contains the vitamins), salads, liver, kidneys and tripe. Special vitamins are contained in carrots, potatoes, wholemeal bread, whole wheatmeal and oatmeal, bran, tomatoes, oranges, lemons, and other fruits, peas, and beans.

THE COUNTRY WOMAN.

By arrangement with the Domestic Science and Technical Services of the Department of Public Instruction, information of especial interest to country women is published regularly under this heading.

SIMPLE COOKERY.

OATMEAL PORRIDGE.

Materials—1 oz. oatmeal; ½ pint water; pinch salt.

Utensils—Saucepan; wooden spoon.

Method—

1. Soak oatmeal in part of the water; put remainder of water into saucepan over the fire.
2. When the water boils, add soaked oatmeal.
3. Stir till it boils; add salt.
4. Simmer for 1 hour; stir occasionally.

CHEESE CAKES.

Materials—For pastry: ¼ lb. lard; ½ lb. flour; ½ gill water; ½ teaspoonful baking-powder; 3 tablespoonfuls of jam. For cake mixture: 3 oz. butter or dripping; 3 oz. sugar; 2 eggs; 5 oz. flour; 1 teaspoonful baking-powder.

Utensils—Bowl; wooden spoon; sieve; teaspoon; rolling-pin.

Method—

1. Sift flour, baking-powder, and salt into a bowl.
2. Rub lard in with the tips of fingers.
3. Add water; make into a dry dough.
4. Place on a floured board; roll out thin; cut with round cutter.
5. Place in patty tins.
6. Put half a teaspoonful of jam in centre of pastry.
7. Cover with cake mixture.
8. Bake in a moderately hot oven for 20 minutes.

Cake Mixture.

1. Place butter or dripping and sugar in a bowl.
2. Beat till creamy.
3. Add eggs one by one.
4. Add flour mixed with baking-powder.

GRILLED CHOPS.

Materials—1 lb. chops; 1 teaspoonful butter or dripping; pinch of salt and pepper.

Utensils—Knife; gridiron; dish.

Method—

1. Trim the chops; remove fat.
2. Rub chops over with a little butter or dripping.
3. Place on gridiron.
4. Grill 3 minutes on each side.
5. Place on a hot dish.
6. Spread lightly with butter; sprinkle with salt and pepper.

BOILED CABBAGE.

Materials—1 small cabbage; 1 teaspoonful salt; 2 pints water; ¼ teaspoonful soda; pepper; ½ teaspoonful butter.

Utensils—Bowl; knife; saucepan; dish.

Method—

1. Remove outside leaves and cut cabbage into suitable pieces.
2. Soak in salt and water for half an hour to remove dirt or insects.
3. Put water into a saucepan on the fire; bring to the boil.
4. Add cabbage, salt, and soda.
5. Boil 15 minutes.
6. Strain; press; cut up finely; sprinkle with pepper; add butter; serve on a hot dish.

MASHED POTATOES.

Materials—1 lb. potatoes; 1 teaspoonful salt; 1 pint water; ¼ cup milk; 1 dessertspoonful butter or lard.

Utensils—Bowl; knife; saucepan; fork; masher; dish.

Method—

1. Wash old potatoes; peel thinly.
2. Cut into even-sized pieces.
3. Put into a saucepan; cover with cold water.
4. Add salt; put on lid; boil till tender.
5. Strain off water; dry; mash.
6. Add butter or lard and milk.
7. Beat well; serve.

BREAD AND BUTTER PUDDING.

Materials—2 eggs; 1 pint milk; 1 dessertspoonful currants or sultanas; 1 dessertspoonful sugar; 2 slices bread and butter; grating of nutmeg.

Utensils—Bowl; whisk; knife; grater; pie dish; baking-tin.

Method—

1. Break eggs into a basin; beat well.
2. Pour in milk; add sugar.
3. Grease a pie dish; place in it layers of thin bread and butter.
4. Add washed currants or cleaned sultanas; pour eggs and milk over all; allow to stand for quarter of an hour.
5. Grate nutmeg over top; put pie dish into a baking tin having water in it about 1 inch deep.
6. Bake in a very slow oven three-quarters of an hour.

SCONES.

Materials—½ lb. flour; ½ teaspoonful salt; 1 dessertspoonful lard; ¾ cup milk; 1 tablespoonful milk for brushing over; ½ teaspoonful carbonate of soda; 1 teaspoonful cream of tartar.

Utensils—Bowl; sieve; board; knife; baking tin; brush.

Method—

1. Sift flour, soda, cream of tartar, and salt into a bowl.
2. Rub in lard with tips of fingers.
3. Add milk; make into a dough.
4. Place on a board; work lightly; press out; shape into two round pieces.
5. Divide each piece into four pieces; place on a floured tin; brush over with milk.
6. Bake in a hot oven for 20 minutes.

ROAST LOIN OF MUTTON.

Materials—Loin mutton; 1 tablespoonful flour; 2 pinches pepper; salt; 1 tablespoonful water.

Utensils—Cloth; baking-dish; trivet; iron spoon.

Method—

1. Wipe meat well with a damp cloth; weigh it; separate joints.
2. Sprinkle with flour, pepper, and salt.
3. Heat dripping in baking-dish; add water.
4. Place meat on a trivet in a baking-dish.
5. Bake in a hot oven, basting every 30 minutes; allow 15 minutes for each lb. and 15 minutes over.

BEEF TEA.

Materials—½ lb. gravy beef; ½ pint water; 1 piece of bread; pinch of salt.

Utensils—Jar; saucepan; cup; basin; knife.

Method—

1. Wipe meat with damp cloth; remove fat and gristle; cut or shred meat across the grain; soak it in cold water for half an hour.
2. Put meat and water into a jar; stand jar in a saucepan of hot water.
3. Place on stove; keep water in saucepan at simmering point for 30 to 40 minutes.
4. Add salt; stir well; remove meat.
5. Serve in a cup; with sippets of toast.

BAKED POTATOES.

Materials—1 lb. potatoes; pepper; salt.

Utensils—Basin; knife; baking-tin; fork; vegetable dish.

Method—

1. Wash and peel potatoes thinly.
2. Cut into pieces of even size.
3. Place in baking-dish in the dripping under meat.
4. Sprinkle with pepper and salt.
5. Cook for 35 to 40 minutes.
6. Serve in a hot vegetable dish.

BOILED LIMA BEANS.

Materials—1 cup of beans; 1 teaspoonful salt; pinch of soda.

Utensils—Bowl; saucepan; dish.

Method—

1. Soak beans in water over-night.
2. Put water in a saucepan over the fire; when hot, add beans, salt, and soda.
3. Boil till tender; drain.
4. Serve with white sauce in a hot vegetable dish.

WHITE SAUCE.

Materials—1 dessertspoonful butter or lard; 1 dessertspoonful flour; ½ pint milk; ¼ teaspoonful salt.

Utensils—Saucepan; wooden spoon.

Method—

1. Heat butter or lard in a saucepan.
2. Add flour; mix well; add salt.
3. Add milk gradually, stirring all the time.
4. Cook for 3 minutes.

INVALID COOKERY.

Renewal of Waste in the Body.

The animal cell in the human body is made up of water, protein, carbohydrates, fat, mineral matter. Foodstuffs are made up of water, protein, carbohydrates, fat, mineral matter. Some of the proteins in animal cells are albumen, globulin, myosin, fibrinogen. Some of the proteins in foodstuffs are albumen, globulin, casein,

gluten. The carbohydrates in animal cells are sugar and glycogen. The carbohydrates in foodstuffs are sugar, starch, and cellulose. Animal cells are used up as long as the animal is alive; and this waste of cell stuff must be made good by taking suitable food. In the body, therefore, the loss of water must be made good by water, protein by protein, carbohydrates by carbohydrates, and so on. The protein and carbohydrates in foodsuffs are assimilated to the protein and carbohydrates of the body during the processes of digestion and absorption.

A Calorie is the amount of heat required to raise 1 kilogram of water 1 deg. C.

	Calories per hour.
A man sleeping requires	65
A man sitting at rest requires	100
A man at light muscular work requires	170
A man at active muscular work requires	290
A man at severe muscular work requires	450
A man at very muscular work requires	600

(Attwater and Benedict).

Approximate Food Requirements for One Day.

	Calories.
Man doing light muscular work	3,000 to 3,500
Woman doing light muscular work	2,700
Boy, 14 to 17 years	2,500 to 3,000
Girl, 14 to 17 years	2,200 to 2,600
Children, 10 to 13 years	1,800 to 2,200
Children, 2 to 5 years	1,200 to 1,500
Children, 1 to 2 years	900 to 1,200

Analysis of the Processes of Digestion.

What we speak of as digestion of food embraces the following actions or processes:—

(*a*) Food is taken into the mouth.
(*b*) It is masticated by the teeth.
(*c*) It is moistened and changed by the alkaline saliva.
(*d*) It is swallowed by the muscular contraction of the tongue, pharynx, and throat, passed down the œsophagus by peristaltic contraction into the stomach.
(*e*) It is there diluted by the addition of acid gastric juice.
(*f*) Movements of the muscular walls of the stomach help to mix the food and digestive juice thoroughly.
(*g*) The semi-solid food is reduced to a thick liquid called chyme, and its protein contents are changed.
(*h*) When the chyme has reached a certain state of acidity the opening of the pylorus allows the food to pass into the duodenum.
(*i*) Here a duct supplied by two branches pours bile from the liver and pancreatic juice from the pancreas into the chyme in the duodenum. Any starch which has remained unchanged becomes sugar; proteins are split into simpler substances and fat is emulsified.
(*j*) The result of these changes and of the addition of fluid reduces the chyme to what is called chyle.
(*k*) Glands in the walls of the intestine add intestinal juice (succus entericus) to the chyle.
(*l*) In this diluted state the food is absorbed by fine velvety processes called villi thickly distributed over the lining of the intestines; each process contains a network of blood vessels and one or more tubes called lacteals. The blood vessels receive from the chyle water with protein, sugar and salt in solution, and carry these foods to the portal vein. The lacteals receive the emulsified fat and convey it to the lymphatics. These vessels pour their contents into the thoracic duct, which in its turn is connected with the jugular vein.

In these ways the foodstuffs are treated in the alimentary canal, made fit to nourish the cells, and conveyed to the circulatory system for distribution throughout the body.

Digestive Juices.

1. *Saliva*—Water, salts, ptyalin which changes starch into sugar.
2. *Gastric juice*—Water, hydrochloric acid, rennin which curdles milk, pepsin which splits protein.

3. *Pancreatic juice*—Water, salts, trypsin which splits protein, amylopsin which changes starch into sugar, steapsin which splits fat.

4. *Bile*—Water, salts, cholesterin; bile emulsifies fat.

5. *Succus entericus*—Water, salts, a ferment which acts on sugar.

The following is a summary of the parts of the alimentary canal, the means by which they assist digestion, the kinds of food that each acts upon, and the action that results therefrom:—

Part of the Alimentary Canal.	Glands.	Secretion.	Food which this Secretion acts upon.	What this Food is changed into.	How the Product gets to the Blood.	What this Product is used for in the Body.
1. Mouth ..	Salivary (3)	Saliva	Starch	Sugar	By capillaries of portal vein	Producing heat, energy, and for the producing of fat
2. Stomach ..	Gastric	Gastric juice	Proteins	Peptones	By capillaries of portal vein	Building tissue and the production of heat and energy.
..	Liver	Bile	Fats	Emulsion	By lacteals and lymphatics	As in 1st
3. Small Intestine	Pancreas	Pancreation juice	Starch sugar proteins fat	Dextrose maltose amino acids emulsion	See line 2	As in 1st and 2nd
	Intestinal	Succus Entericus	Cane sugar	Dextrose	See line 2	As in 1st

LIQUIDS AND THEIR PREPARATION.

Milk is perfect food for young children and invalids; because it contains everything necessary to build tissue and produce energy. The curd forms tissue. Milk fat and milk sugar are energy producers. It should be the most important article in the diet of children up to the age of five years. For older children and healthy adults it contains too much protein and fat and too little iron; infants kept too long on milk alone become anæmic; if there is difficulty in digesting milk, it may be diluted with barley, rice, or lime water.

Lime and salt form bone and keep the body healthy.

Whey is a soothing drink, easily digested; all curd must be strained from it; rennet, wine, or lemon juice may be used in making whey.

Lime Water.—Lime water should be strained when perfectly clear; it neutralises acidity of the stomach; a dessertspoonful in milk or in any liquor which contains milk does not affect the flavour and renders it more digestible.

Grains.—Grains such as barley and rice must be washed well in three waters. If barley is not well washed, barley water will have a bluish appearance; barley may be used twice for an infusion; the decoction must be simmered for two hours. Barley water may be made without flavouring; milk may be added after straining. Carolina rice is best for rice water; a tablespoon of sherry or port may be added to rice water; flavour may be varied by using ginger or cinnamon.

Oatmeal Water.—There are three kinds of oatmeal—coarse, medium, fine. Coarse meal is the best because nourishing parts of the grain are lost in the refining. Meal must be fresh, and should be kept in a dry place. Damp oatmeal tastes bitter. Oatmeal water is strained to exclude husks.

Chocolate must not be boiled longer than necessary; half water and half milk may be used; cheap chocolate should be avoided.

Toast Water.—Crust of bread is best for making toast water as it does not turn sour; both sides should be toasted until dry and nicely browned; directly the water is coloured it should be strained.

Apple Water.—Fresh, juicy, sharp-flavoured apples are best; they must be washed, not peeled, and thinly sliced; the water used must be freshly boiled.

Lemonade.—Lemons should be wiped and rolled on the table to soften them; the minutest portion of white pith will make lemonade bitter; barley, rice, or soda water may be used instead of water.

Linseed Tea.—The whole linseed must be used; if linseed is bruised the tea will be bitter.

Tea.—Good tea is free from dust and stalks; fragrance is the best test; the water must be freshly boiled, because the loss of gases in continued boiling changes the water; the kettle must be clean inside and out; the teapot should be heated; five minutes should be allowed for infusion.

Coffee should be freshly roasted and ground; if that is impossible it should be bought in small quantities and kept in a box with a tight-fitting lid. If liked, chicory may be added in the proportion of 1 oz. to ½ lb. coffee; the water must be freshly boiled; milk should be scalded but not quite boiled; for strong coffee equal quantities of coffee and milk should be used.

FRUIT PRESERVING.

Strawberry Jam.

Method—

1. Wash and remove stems from strawberries; cut fruit into halves.
2. Put into preserving pan; add sugar.
3. Stir well, remove scum, add lemon juice.
4. Boil till a small quantity will jelly.
5. Put into jars; seal down airtight.

Utensils—Bowl, knife, preserving pan, wooden spoon, squeezer, jars.

Materials—For each lb. of strawberries allow 1 lb. sugar and 1 teaspoonful of lemon juice.

Strawberry Conserve.

Method—

1. Wash and pick stems from strawberries.
2. Put whole fruit into preserving pan, add sugar.
3. Stir, remove scum, add lemon juice.
4. Boil till a small quantity will jelly.
5. Put into jars, seal down airtight.

Utensils—Bowl, knife, preserving pan, wooden spoon, squeezer, jars.

Materials—To each 1 lb. strawberries add 1 lb. sugar and 1 teaspoonful lemon juice.

Note.—When strawberries are plentiful, juice obtained by crushing part of the fruit may be used to make syrup with the sugar. The whole fruit are then cooked in the syrup.

Strawberry Syrup.

Method—

1. Wash and stem strawberries.
2. Crush fruit in a fine sieve over a bowl; measure juice.
3. Put juice into a preserving pan; add sugar and acid dissolved in water.
4. Boil for ten minutes.
5. Strain and bottle; seal down.

Utensils—Knife, sieve, wooden spoon, cup, strainer, bottles.

Materials—To each cup of juice allow ¼ cup sugar and 1 crystal of citric acid.

Note.—Jam may be made from the pulp left in the strainer by adding 1 cup of sugar to each cup of pulp, and boiling till a small quantity jellies on a plate.

AUGUST AND SEPTEMBER.

Cape Gooseberry Jam.

Method—

1. Wash fruit; pick it over carefully; drain and dry fruit.
2. Bruise some ripe berries in the bottom of the preserving pan.
3. Boil for fifteen minutes; add remainder of fruit.
4. Add sugar; boil for one hour.
5. Let the jam stand in the preserving pan till it is cool.
6. Bottle and cover.

Utensils—Bowl, sieve, cloth, preserving pan, wooden spoon, jars.

Materials—1 cup sugar to each cup of fruit.

Cape Gooseberry Conserve.

Method—

1. Pick fruit over carefully; wash, drain, and dry it.
2. Prick fruit with a darning needle or long pin; put it into a preserving pan.
3. Add sufficient water to keep it from burning.
4. Boil for thirty minutes; add sugar.
5. Cook till a small quantity jellies on a cool plate.
6. Allow to cool in pan before bottling.

Utensils—Bowl, sieve, cloth, needle or long pin, wooden spoon, preserving pan, jars.

Materials—1 cup of sugar to each cup of fruit; 2 cups of water to 6 lb. fruit.

Loquat Jam.

Method—

1. Cut off tops of loquats, remove seeds, and put them into a bowl.
2. Cover with boiling water, allow to stand half an hour.
3. Strain liquid over the fruit.
4. Boil gently thirty minutes or until fruit is tender.
5. Add sugar and boil twenty minutes or until the jam jellies from the spoon.
6. Put jam into jars while hot.

Utensils—Preserving pan, bowl, cup, wooden spoon, preserving jars.

Materials—Loquats; 1 cup sugar to 1 cup pulp.

Loquat Jelly.

Method—

1. Cut tops and ends from loquats.
2. Put fruit into a preserving pan; add sufficient water to come halfway up the fruit.
3. Boil till tender.
4. Strain; measure juice; add 1 cup of sugar to 1 cup of juice.
5. Boil juice till a small quantity will jelly.
6. Put into jars; seal down airtight.

Utensils—Knife, preserving pan, strainer, cup, jars.

Materials—Loquats; 1 cup sugar to each cup of juice.

Note.—The amount of water depends on the juiciness of the fruit.

Pineapple Jam.

Method—

1. Remove cores; scrape out pulp finely.
2. Cover bottom of preserving pan with water; add pulp.
3. Cook gently till tender.
4. Measure pineapple pulp.
5. Add 1 cup of sugar to 1 cup of pulp.
6. Boil till a small quantity allowed to drop on a plate sets.
7. Put into jars when slightly cool; cover down airtight.

Utensils—Preserving pan, spoon, cup, jars.

Materials—Pineapples; 1 cup sugar to each cup of pulp.

Pineapple and Pie-melon.

Method—

1. Peel melon and pineapples; remove eyes and core of pineapples.
2. Cut melon into dice, removing seeds; cut pineapple into dice.
3. Put into a preserving pan.
4. Add water.
5. Boil till tender.
6. Measure pulp; add 1 cup of sugar to 1 cup of pulp.
7. Boil till a small quantity allowed to drop on a plate sets.
8. Put into jars, cover, label.

Utensils—Preserving pan, knife, cup, jars.

Materials—Pie-melon; pineapple; 1 cup sugar to each cup of pulp; sufficient water to come half-way up fruit in preserving pan.

Preserved Pineapples.

Method—

1. Peel; remove cores and eyes from pineapples.
2. Cut into even-sized pieces.
3. Put into preserving pan of syrup.
4. Cook till tender.
5. Arrange in preserving jar.
6. Cover well with syrup.
7. Secure rubber, and cover down airtight.

Syrup—

1. Put sugar into preserving jar.
2. Add water, stir.
3. Boil for ten minutes.

Utensils—Preserving pan, knife, rubber rings, jars.

Materials—Pineapples; 1 cup sugar to 1 cup water.

Preserved Pineapples (second method).

Method—

1. Peel pineapples; remove eyes.
2. (*a*) Leave the fruit whole; or
   (*b*) Cut each pine into quarters lengthwise, removing cores; or
   (*c*) Cut fruit into slices about ¾ in. thick.
3. Pack fruit carefuly and neatly in wide-mouthed jars; when full place a knitting needle in the jar.
4. Pour boiling syrup over the fruit till the jar is brim full. For syrup *see* Preserved Pineapples (First Method).
5. Seal down; place in canner; bring slowly to 160 deg.; keep at that temperature for 15 minutes.
6. Allow to cool slowly.

Utensils—Knife, jars, saucepan, knitting needle, canner.

Materials—Pineapples; 1 cup sugar to each cup of water.

Crystallised Pineapple.

Method—

1. Remove skin and eyes from pineapple.
2. Cut into thick slices; divide slices into quarters.

3. Boil sugar and water together for ten minutes.
4. Add pineapple; cook till tender.
5. Pour out into a basin; cover; stand overnight.
6. Return syrup to preserving pan; bring to the boil.
7. Pour reduced syrup over pineapple; cover; stand for three days.
8. Repeat 6 and 7.
9. Lift pineapple out of syrup, place on sieve.
10. Dry in a warm oven until the pineapple does not stick to fingers; sprinkle with dry sugar.

Utensils—Knife, preserving pan, basin, sieve.

Materials—1 large pineapple; 4 cups sugar, 2 cups water.

Cherry Jam.

Method—

1. Wash cherries and put them into a preserving pan; add water.
2. Boil till tender, removing seeds as they rise; measure pulp.
3. Add 1 cup sugar to 1 cup of pulp.
4. Boil till a small quantity will jelly.
5. Put into jars, cover down airtight.

Utensils—Knife, preserving pan, cup, jars.

Materials—Cherries; sufficient water to come halfway up fruit; 1 cup sugar to each cup of pulp.

LAUNDRY WORK.

IRONING AND FOLDING.

1. The ironing table, skirtboard, shirt boards, and sleeve boards must be covered with felt or two thicknesses of blanket and a perfectly clean white sheet or cover.

2. The table or skirtboard must be placed so that the light falls on the articles to be ironed.

3. The iron stand should be placed on the right-hand side.

4. The irons must be perfectly clean. Beeswax and cloths for rubbing the irons must be ready in a convenient place.

5. *To clean irons*—

(*a*) Sprinkle fine sand or bath brick dust thickly on a piece of sacking.
(*b*) Rub the iron firmly over the sand or dust.
(*c*) Wipe irons on a waxed cloth.
(*d*) Polish with a clean cloth.

6. *To test the heat of an iron*—

Dip the tip of a finger in cold water and apply it quickly to the face of the iron. If the water changes into steam immediately with a hissing sound, the iron is sufficiently heated.

7. Various kinds of irons are:—Flat or sad irons, charcoal, gas, electric, petrol, polishing, and goffering.

Table Covers—

1. Place the cloth on the table with the right side uppermost. The cloth may be folded and each fold ironed separately.
2. Use a fairly heavy iron so as to get a glossy surface.
3. Iron on the right side only, until the cloth is perfectly dry.
4. Fold by placing the selvedges together, right side inside; bring each selvedge back to touch the middle crease; roll the cloth up in the shape of a cylinder; tie with tape.

Note.—The cloth must be well aired before it is put away, or it will lose its gloss and firmness.

Serviettes—

1. Proceed as for table cover.
2. Iron right side first, then the wrong side.
3. Fold large serviettes in the screen fold. Fold over one-third with the right side outside and the name, number, or initial in the top right-hand corner. Fold back the remaining third underneath, and repeat from left to right.

4. Small serviettes are folded by placing the selvedges together and doubling the selvedges down on the middle line. The oblong thus obtained is folded in half crossways twice.

Body Linens—

1. All small parts, such as frills and embroidery, should be ironed first.

   Note.—Embroidery must be ironed on the wrong side only.
2. Bands and yokes must be ironed on both sides in order to dry them.
3. The body may then be ironed, taking the point of the iron well into gathers and drying every part thoroughly.
4. As most body linen has to be ironed double, care should be taken to smooth out the under part before the upper part is ironed.
5. Frills are improved by being goffered.

   For goffering—

   (*a*) Test the heated goffering iron on a piece of cotton.
   (*b*) Place the garment flat on the table.
   (*c*) If there is more than one frill, begin with the frill farthest from the edge of the garment.
   (*d*) Take up a small piece of the frill between the prongs of the iron.
   (*e*) Turn the iron to the right, drawing back the frill with the left hand.
   (*f*) Work from right to left, keeping an even distance between each goffer.
6. Under-linen may be folded like a dress shirt to show all the front.

   This method is called the "Front Fold." Usually it is folded in the "Side Fold."

The Side Fold.

Fold the garment in half, placing side seams together.

Arrange the fullness in pleats from the neckband or yoke, pressing each flat with a warm iron.

Turn over the shaped side pieces until the width is even at top and bottom.

Fold upwards from the bottom three or four times.

Turn so as to show embroidery or frills, folding sleeves underneath, but turning the trimming at the wrist back over the front.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Farm Notes for November.

FIELD.—Farmers are commencing to realise that quick-maturing wheats which possess a degree of rust resistance are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plants. When the young maize plant has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kaffir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghums have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

Orchard Notes for November.

THE COASTAL DISTRICTS.

NOVEMBER is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few limes, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools being overcrowded with too many suckers. Keep the land well worked and free from

weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of Mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil, and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely ground phosphatic rock to the acre, and, if the soil is deficient in lime, a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account be allowed to grow. If blady grass makes its appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young papaw plants that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack of moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first appearance of the mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit it appears to be covered with a grey dust, and if the fruit is examined with a good lens, it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium or potassium sulphide washes, as recommended by the Department, or with a weak solution of lime-sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early ripening peaches or other fruit that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Act, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Keep the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as, if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the

land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged at the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this, the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully, and, on its first appearance in a district, all ripening fruit should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Bungundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

PROTECTING WATER TROUGHS.

Here is a device for preventing injury to stock and to the water trough itself. AA Fig. 1 are supports of hardwood or saplings let into the ground, bolted together at the top, and placed at intervals along the trough to carry the side-poles, BB and CC. These side-poles run the full length of the trough, and are bolted to the supports.

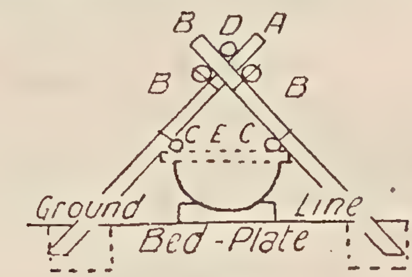


FIG 1.

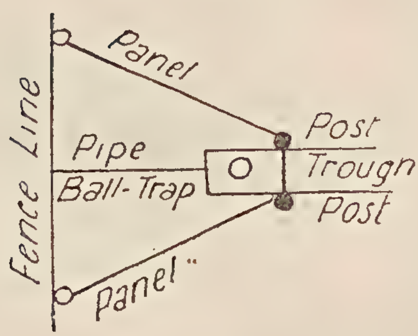


FIG. 2.

If the troughs are for watering stock the horizontal pole D is used instead of the side-poles BB. A temporary board is placed across the trough at E to carry the side-poles CC, but is withdrawn when these poles are bolted to the supports AA. Fig. 2 shows an arrangement for protecting the ballcock.—"Farmers' Advocate" (South Africa).

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

MOONRISE.

Date.	October, 1931. Rises.	October, 1931. Sets.	November, 1931. Rises.	November, 1931. Sets.	Oct., 1931. Rises.	Nov., 1931. Rises.
1	5.36	5.48	5.5	6.7	p.m. 9.49	p.m. 11.28
2	5.35	5.48	5.4	6.7	10.47	11.28
3	5.34	5.49	5.4	6.8	11.43	a.m. 12.19
4	5.33	5.50	5.3	6.8	...	1.3
5	5.32	5.50	5.2	6.9	a.m. 12.39	1.41
6	5.31	5.51	5.2	6.10	1.39	2.15
7	5.29	5.51	5.1	6.10	2.25	2.47
8	5.28	5.52	5.1	6.11	3.7	3.23
9	5.27	5.52	5.0	6.12	3.44	3.58
10	5 26	5.53	4.59	6.13	4.20	4.40
11	5.25	5.53	4.59	6.14	4.55	5.23
12	5.24	5.54	4 58	6.15	5.30	6.21
13	5.23	5.54	4.58	6.16	6.8	7.20
14	5 22	5.55	4.57	6.16	6.50	8.21
15	5.21	5.55	4 57	6.17	7.40	9.24
16	5.20	5.56	4 56	6.18	8.37	10.23
17	5.19	5.56	4 56	6.19	9.36	11.21
18	5.18	5.57	4.56	6 20	10.37	p.m. 12.15
19	5.17	5.58	4.55	6.21	11.35	1.9
20	5.16	5.58	4.55	6.22	p.m. 12.33	2.1
21	5.15	5.59	4.55	6.23	1.29	2.53
22	5.14	5.59	4.54	6.23	2.21	3.43
23	5.13	6.0	4.54	6.24	3.16	4.39
24	5.12	6.1	4.53	6.25	4.5	5.36
25	5.12	6.1	4.53	6.25	4.59	6.34
26	5.11	6.2	4.53	6.26	5.51	7.27
27	5.10	6.3	4.53	6.27	6.46	8.29
28	5.9	6.3	4.52	6.27	7.46	9.25
29	5.8	6.4	4.52	6.28	8.40	10.16
30	5.7	6.5	4.52	6.29	9.38	11.2

Phases of the Moon, Occultations, &c.

5 Oct.	☽ Last Quarter	6 15 a.m.
11 ,,	● New Moon	11 6 p.m.
20 ,,	☾ First Quarter	7 20 p.m.
26 ,,	○ Full Moon	11 34 p.m.

Perigee, 11th October, 2.30 p.m.
Apogee, 24th October, 2.54 p.m.

With the use of a telescope or binoculars Uranus would have been seen within 2 degrees South of the Moon about 6 p.m. on the 25th if it had not been for the Moon being very nearly full; but if the position is noted, and an observation made two or three days later, it will be seen that Uranus will be very slightly to the east of Epsilon and Delta Piscis, which, being of the 4th magnitude, are a good deal brighter than Uranus.

Mercury will rise 32 minutes before the Sun on the 1st October, and 12 minutes before it on the 15th.

Venus will set at 6.15 p.m. on the 1st, and at 6.39 p.m. on the 15th.

Mars will set at 8.16 p.m. on the 1st, and at 8.7 p.m. on the 15th.

Jupiter will rise at 3.7 a.m., and set at 1.55 p.m. on the 1st; on the 15th it will rise at 2.21 a.m., and set at 1.9 p.m.

Saturn will rise at 11.39 a.m., and set at 1.15 a.m. on the 1st; on the 15th it will rise at 10.49 a.m., and set at 12.20 a.m.

The Southern Cross, on the 1st October, will be upright at midday, and at its lowest position at midnight on or near the 150th meridian. Observers on either side of the meridian must allow 4 minutes earlier for each degree eastward, or later westward. At 6 p.m. the Cross will be 30 degrees west of the south celestial pole, and at 6 a.m. 30 degrees east of it, being horizontal in both of these cases. During the rest of the month allow 4 minutes earlier for each day.

3 Nov.	☽ Last Quarter	5 17 p.m.
10 ,,	● New Moon	8 55 a.m.
17 ,,	☾ First Quarter	12 13 p.m.
25 ,,	○ Full Moon	5 10 p.m.

Perigee, 9th November, 1.0 a.m.
Apogee, 21st November, 2.48 a.m.

Half an hour after sunset on November 1st observers will barely be able to catch a glimpse of Mercury close to the western horizon, but Venus will still be far enough above it to be seen more distinctly as it too sinks to the horizon. Mars will be higher up, by about one and-half times the length of the Southern Cross from Venus. These three planets will be apparently in the constellation Libra. Night after night they will become more distinctly observable as they get closer to one another. The culminating point of this interesting gathering will be on the 19th soon after midday, when Venus and Mars will seem almost to touch one another but will not be quite so close when darkness comes on. Mercury also will be remarkably close, being within one and a half degree of the other two planets.

After the 19th it will be interesting to watch the widening of the apparent distances between these planets half an hour or more after sunset.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts **FREE** on prepayment of **One Shilling** to cover postage. Members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXVI. 1 NOVEMBER, 1931. PART 5.

Event and Comment.

The Agricultural Year in Queensland.

REVIEWING generally the agricultural year in Queensland in his Annual Report to the Minister for Agriculture and Stock (Hon. Harry F. Walker), Mr. E. Graham, Under Secretary and Director of Marketing, said that apart from depression in price levels, a common experience of rural industry the world over, sound progress was made in every department. This was assisted by the generally good season that prevailed in every agricultural area, and other factors were improved practice in every branch of primary production, the recognition of the immense value of agriculture in a period of national reconstruction made necessary by the universal economic conditions, and the imperative call for higher standards in an increasingly competitive age. The special problem of agriculture at present is that of maintaining and increasing the production of exportable products, which will help materially in preserving a national economic balance.

Economic stability was most noticeable in the well-organised industries. Queensland farmers are fortunate in their possession of a system of organisation that is proving its value in the present abnormal conditions affecting production, trade, and commerce. They have sound reason for satisfaction with the system operating in this State, and commendation for the statesmanlike vision of its promoters. No stronger test, up to which it is standing well, could be placed upon it than that imposed by the present crisis in our affairs. An unorganised agricultural industry dealing with highly-organised business in the world to-day is unthinkable. Queensland farmers realised this in time, and the system of organised marketing erected by them is proving one of the best protective measures that they could have devised. Every primary industry is affected by the losses due to the general business slump and the world-wide price decline. In the unorganised, or partially organised sections, commodity disposal remains largely out of balance with the market.

Departmental services during the year, added Mr. Graham, covered a wide and extending field of effort, and to their success is due, in a large measure, the technical progress made in primary production in the State. On the scientific side, farmers who realise the value of research are its strongest supporters. Notable results were achieved in entomological and veterinary scientific work, in the administration of live-

stock laws and regulations, and the adoption of control methods for the suppression of animal and vegetable pests and diseases. In dairy cattle breeding and herd improvement, principles were developed which are being applied more widely and which should increase greatly the productivity of our milking cows. The Departmental herd improvement scheme, supported strongly by dairy farmers, is recognised as an important means of translating dairy science into dairy practice.

The grasslands form one of the greatest natural resources of this State, a resource which has been much neglected. Experiments of recent years show that by no other avenue in crop husbandry can greater increase in yield and quality be gained than by correct management of our grass crop.

It is pleasing to record that there is a manifestation of keener interest in pasture improvement, and an indication of a fuller realisation of the wealth of biological forces that are at work constantly in a grazing field. Pastures constitute the fodder for the raising of stock, sheep, cattle and horses, and are the raw material for the formation of milk, cheese, butter, beef, mutton, wool, hides, tallow, and other by-products which comprise the major portion of our trade and commerce with Great Britain and other countries. It is estimated that 60 per cent. of the total exports of the Commonwealth are derived from grass land sources, and in the case of Queensland the percentage is relatively higher, and possibly exceeds 80 per cent. Is it necessary to say more in order to stress the importance of pastures and their intimate relationship to our everyday life? The correlation between improved pastures and increased wealth is obvious.

One of the notable events of the year was the ratification of a reciprocal trade treaty with Canada which was announced recently. There has not been time yet, of course, to observe any effect on the tariff due to this arrangement, but it is difficult to estimate the advantage that must accrue from it to Queensland agriculture. It is true that the Dominion is also a country of primary production, but the fact that Australia and Canada are situated in different hemispheres with opposite seasons provides an opportunity for Queensland trade in tropical fruits, temperate fruits, and other produce for which Canada has an off season, but which, nevertheless, are in constant demand.

John Monash.

ONE of the saddest events of the month, and of the year, was the death of Lieutenant-General Sir John Monash, G.C.M.G., K.C.B., V.D., D.Eng., D.C.L., LL.D., B.A., which occurred in Melbourne on 8th October. He was one of the most distinguished of the Allies' leaders in the European war, probably the first soldier who was a civilian at the outbreak of hostilities in 1914 to attain to the command of an army corps on the Western front, and one of the most gifted of Australia's sons. His death marked the passing not only of a great soldier, but of an Australian whose outstanding capacity in civil life, before and after the war, has left an enduring impress on the industrial and economic life of the Commonwealth.

Great honours and the elevation to high command in a time of national crisis left the man in John Monash quite unspoiled; his peculiar qualities of mind and character won for him an affection in the hearts of every Australian soldier who fought under him in Gallipoli and in France. Though already an expert fighting force under General Birdwood when General Monash took command, the Australian Corps under him acquired an added strength and prestige which fixed its splendid reputation definitely in the annals of British arms.

To him was accorded that rare honour—knighthood on the field of action. That simple and profoundly impressive ceremony performed by His Majesty the King at Bertangles on 12th August, 1918, remains a lasting memory with every surviving Australian soldier who was privileged to witness it. "In the uniform he wore, stained with long service as becomes a man," he knelt to receive the accolade at the hands of his Sovereign in the presence of five hundred men—one hundred from each of his famous Divisions—stalwart Diggers, gaunt and grimed, yet fit and keen, "the toughest veterans in Normandy" relieved for the occasion from the battle line. On all sides parked wheel to wheel were captured guns, first trophies of the great advance that commenced four days earlier, and continued to the final Australian victory at Montbrehain after the breaching of the Hindenburg line, and ended with the Armistice. Could any commander ask for a finer guard or receive a higher honour?

As a volunteer soldier in an unprecedented emergency that called for big men, and as a plain citizen whose work in peace surpasses even his achievements in war, his record was truly remarkable. Efficiency always his aim, he left nothing to chance. He demanded the best in men and got it, and retained in an extraordinary degree the confidence and goodwill of all ranks of the Australian Corps. When the tremendous tasks of war were ended, he returned unobtrusively to civil life in which

he was to win still further distinction in the service of the Commonwealth. He was a Doctor of Engineering, a Doctor of Laws, a Bachelor of Arts, and Vice-Chancellor of the Melbourne University; as well as a D.C.L. of Oxford and a LL.D. of Cambridge, and a past president of the Australian and New Zealand Association for the Advancement of Science.

It was characteristic of the man in all his triumphs to pay just and well-merited tribute to those who served under him, from the Digger to the Divisional Commander, and this is shown right through his brilliant post-war memoir—"Australian Victories in France in 1918." In the words of the Governor-General, Sir Isaac Isaacs, all Australia mourns the loss of "one of her ablest, brave, and noble sons, a loyal servant of King and country, distinguished alike in peace and war, a true comrade of those he led in the defence of liberty, a faithful administrator, a skilful commander, and a public-spirited citizen, whose watchword in all he undertook was the complete performance of his duties as he saw them. He served Australia and the Empire well, and in his passing he has left an example which will be a beacon light of patriotic and unselfish endeavour."

NOTICE TO SUBSCRIBERS.
SPECIAL AND IMPORTANT.

Under the Commonwealth Postal Regulations it is NO LONGER PERMISSIBLE to indicate the expiry of subscriptions with a BLUE CROSS on the first page of the Journal. So in the future that reminder will NOT appear.

The need for the strictest economy makes any other form of reminder at present impracticable. THE ONUS OF REMEMBERING THE DATE OF EXPIRY OF, AND RENEWING THE SUBSCRIPTION PROMPTLY IS, THEREFORE, PLACED ON EACH SUBSCRIBER.

As about 1,000 subscriptions expire each month, the cost of a postal reminder is, in present circumstances, prohibitive. Readers will, therefore, appreciate that fact, and will, no doubt, help us to retain their names on our mailing list by kindly noting the date of payment of their subscriptions and, on expiry, sending in their renewals at once.

Instead of just sending the annual subscription—one shilling—along, it is suggested that, when renewing, they do so for two or three years, or even a longer term. For instance, FIVE SHILLINGS would keep a name on our subscribers' register for FIVE YEARS.

By doing this subscribers would help greatly in reducing clerical labour, as well as avoid the inconvenience to themselves of posting annually the very small sum necessary for their registration.

Readers renewing their subscriptions should USE THE ORDER FORM on another page, which should be filled in FULLY and CORRECTLY. Renewals by letter do not as a rule give the essential information, thereby causing unnecessary waste of time and much inconvenience. The Form is also our record, and orders which come by letter require special handling to adapt them to our card recording system.

When an address on the Order Form is not that to which the Journal has hitherto been sent, attention should be called to the new address, and the former address given. This assists us to identify subscribers, of whom we have many of the same name, often in the same district, as well as in different parts of the State.

Women subscribers should add to their names the word "Mrs." or "Miss," as the case may be. This is a constantly recurring omission, and its correction causes a lot of unnecessary labour in checking electoral rolls and other references. Wives and children of subscribers should apply in the subscriber's name, and so facilitate registration.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART XX.

(e) Health in the Tropics.

THE bogey so often raised as to the deterioration of the white race in the tropics of Queensland and the pernicious effect of the climate on the stamina of the people dwelling therein, appears now to have been pretty well laid. In the early days of settlement for sugar-growing, there were some grounds for thinking that the climate might ultimately prove injurious, for malaria to a limited extent and coastal fevers of divers descriptions were from time to time prevalent, particularly in what were then called "scrubs," but which now rejoice in the perhaps more scientific term of "rain forests."

Ling Roth, writing in 1880, stated that the mean death rate for Australia was 16·32 per 1,000, and at that time the death rate in Queensland was 17·25 per 1,000. The death rate in other tropical countries was given as under:—

Country.	Year.	Death Rate per Thousand.
Mauritius	1876	27·50
British Guiana	1875	36·38
Barbados	1876	21·76
St. Vincent..	1872–6	28·00
Antigua	1875–6	32·87
Trinidad	1876	30·50
Montserrat..	1874–5	20·44

In the evidence given before the 1889 Royal Commission on the condition of the sugar industry in Queensland which has been previously referred to, some of the witnesses in the far North said there was a great deal of fever when the scrub was being felled and that Europeans suffered more than Chinamen.

Doctor G. T. White, of Innisfail, told the Commissioners that the general health improved as the scrub got cleared. Europeans generally suffered from malarial fever. At one time it was of a very bad type, but it was getting better every year. He had seen no cases of sunstroke and only one of apoplexy.

There still lingers a little doubt on the health question, and it is intended in this section to marshal as much evidence as I have available to combat the idea that life in the Queensland tropics is subject to all kinds of climatic drawbacks.

Dr. R. W. Cilento, in "The White Man in the Tropics," says—

> "Australia has the unique distinction of having bred up during the last seventy years a large resident pure blooded white population under tropical conditions . . . . this more happy experience is directly referable to the relative absence of tropical diseases, and also of a resident native race. To the great majority of the inhabitants of temperate climates the word 'tropical' conjures up visions of sweltering mangrove flats, the haunts of the crocodile, of rank and steaming forests that exhale the musky odour of decaying vegetation, deadly snakes, &c.

" . . . The tropical areas of Australia are unique in that they have no teeming native population riddled with disease, but are occupied by many thousands of pure blooded European settlers (103,000 along the eastern coast of Queensland alone). These settlers, some of them of the second and third generation, make up altogether the largest mass of a population purely white, settled in any part of the tropical world, and represent a huge unconscious experiment in acclimatisation, for here the white settler is not in a position as lord of a native race, but is simply a working man carrying out every occupation from the most laborious tasks to the higher grades of mental effort. . . . One of the worst features of residence in the tropics is the tendency of white immigrants to regard their period of residence as a temporary sojourn only, though this is becoming yearly less and less noticeable in Queensland where the main mass of the population is Queensland born."

Dr. Cilento quotes the following from a paper contributed by the Chief Actuary of the Australian Mutual Provident Society (C. A. Elliott), who, as the result of the examination of nearly 5,000 policies issued to adults during the years 1910 to 1919 inclusive, from the Cairns and Townsville offices, arrived at the following conclusions:—

"The rates of mortality deduced from the inquiry were surprisingly low; the actual deaths for the period reviewed were 68, while the number of deaths expected from A.M.P. experience, 1849 to 1903, if all policies had been whole life assurances was 88, or, if endowment, 81. I have no hesitation in saying that so far as we know at present there is no need for life assurance officers to treat proponents who live in North Queensland differently from proponents who live in other parts of Australia."

The infantile mortality statistics from 1907 to 1916 proved conclusively that North Queensland compared favourably with Central and South Queensland, while it was lower than that of Victoria and Tasmania. The birth rate was lowest in Victoria, somewhat higher in Tasmania, and highest of all in Queensland.

The Australian Medical Congress passed a resolution in 1920 stating they "were unable to find anything pointing to the existence of inherent or insuperable obstacles in the way of the permanent occupation of tropical Australia by a healthy indigenous white race."

Dr. J. S. C. Elkington, Director, Division of Tropical Hygiene, Commonwealth Department of Health, in an article entitled "White Women in the Australian Tropics," stated that an extensive sociological inquiry carried out in 1924 by the Australian Institute of Tropical Medicine proved that the health of the average house-mother was good. The tropical-born baby's chances of survival are substantially better than those born in London, Switzerland, England and Wales, Canada, or Scotland, and the rest of Australia. Mentally, school children are as far advanced in the tropics as are children born elsewhere in Australia. The tropical Australian child is distinctly taller and somewhat heavier (after relative clothing weights are taken into account) than is his or her fellow-Australians of similar age in the Southern States. Dr. Elkington has personally known tropical Australia and its people for over thirty-five years, and has formed the matured opinion that it is essentially suitable for habitation by white women, their menkind, and their children to many generations.

PLATE 118.—HEALTHY TYPES OF SETTLERS IN THE INNISFAIL CANE DISTRICT OF NORTH QUEENSLAND.

Dr. Humphry, with more than thirty years' residence in the tropics, says: "Anybody who says the race will not thrive in tropical Australia is talking nonsense."

An employer, with twenty years' experience, remarks: "The British gangs head the list (i.e., efficiency and economy of labour) against all comers."

The term "British" is used to cover all white British nationalities, whether born in Australia or Great Britain.

Dr. Cilento, in another article, states—

> "The largest collection of a population entirely white anywhere within the geographical tropics exists in tropical and sub-tropical Australia, and the health of these people shows no decline from the health of people living in the cold countries, but is amongst the best in the world."

The Federal Royal Commission stated in their report that they entertained no doubt as to the possibility of effective settlement by a white population of the Queensland coastal areas. The present population is a normally healthy one, with a fully developed physique, and a low death rate. In evidence given before the Commission, the head mistress of the State school at Mossman stated—

> " . . . . the general standard of health and physical standard here are as good or better than they were in the west. . . . The attendance is better than on the Darling Downs. Only two children who have been in attendance at the school have died since I have been here (thirteen and a-half years). . . . Neither of them was born in the district."

Dr. P. H. Clarke, Government Medical Officer at Port Douglas, stated, *inter alia*—

> "cases of sunstroke were rare; that epidemics were attended by a lower mortality than in the southern portions of Australia; that, with proper care, the probability of children born in the district living to adult ages was greater than in the southern portions of Australia; that the most prevalent cases of tropical complaints were preventable."

Dr. Breinl remarked—

> "A very curious thing is that there is hardly any typhoid north of Townsville. I say that with some reservations. I have seen hardly any cases. . . . Taking the whole range of diseases that are a menace to human life and activity I should think that the North of Queensland is just about the same as the more temperate parts of the continent."

The opinion held by medical men is that the white man can lead a healthy life and rear a vigorous family in tropical Queensland provided he adapts himself to his surroundings, as regards diet and clothing, and avoids alcoholic excesses, which are debilitating in the tropics, and a fruitful cause of sickness amongst the workers in the sugar industry.

The writer of this article has had a long experience of the Queensland tropics and its population, and has never been able to detect any difference in the health of people in North Queensland and those in the Southern States. There is some difference in build and face colour—the Victorian being of stockier type and redder in the face. Football

and cricket are played in the North with the same zest as they are in the South, and hard manual work is done with the same efficiency as in the Southern States.

Mr. C. H. Wickens, the Commonwealth Government Statistician, says there has been a continuous improvement in the health of Queenslanders, and that for many years the general death rate for Queensland has been consistently lower than the average for all Australia. There was no warrant in his opinion for the theory that the reproduction of a white race in low latitudes tended to a reduction in the race of either vitality or fertility.

[TO BE CONTINUED.]

ENTOMOLOGICAL HINTS TO CANEGROWERS.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following Entomological Hints from Mr. E. Jarvis, Meringa:—

Remember Date of First Emergence of Cane Beetles.

Farmers will find it a good plan to make a note of the date on which greyback cockchafers first appear on the wing in cane fields. As stated last month, it seems likely that we may have an early emergence of beetles this season, as during the latter half of October numbers were ploughed up rather freely around Gordonvale.

Growers intending to fumigate their soil should keep a record of the date (or dates, if more than one) of big emergences of this insect from cane lands, as such data will serve as a guide later on as to the correct time for carrying out control work. It need scarcely be mentioned that the first swarming of greybacks usually occurs about twenty-four hours after a fall of from 3 to 4 inches of rain. If, for example, an emergence of this cockchafer (*Lepidoderma albohirtum* Waterh.) were to take place, say, on the 10th November, the following simple table would then indicate approximately the duration of its egg and grub stages of growth, and the date on which to commence soil fumigation:—

Table of Egg and Grub Stages of Greyback Cockchafer, showing Proper Time for Carrying Out Soil Fumigation.

10 Nov.—Emergence of greyback cockchafers.

24 Nov.—Beetles commence egg-laying.

6 Dec.—Hatching of grubs of first instar of growth.

> Duration of first instar lasts about thirty days—6th December to 10th January.
>
> Width of head of first-instar grubs is one-eighth of an inch.

10 Jan.—Appearance of grubs of second instar.

> Duration of instar about thirty-eight days—10th January to 17th February.
>
> Width of head of second-instar grubs is one-quarter inch.
>
> Fumigate soil found to be grub-infested at any convenient time between the dates of about 17th February to 31st May, while the ground is nicely moist, but not in a wet condition.

17 Feb.—Appearance of grubs of the third instar.

> Duration of third instar lasts approximately about sixteen weeks—17th February to 31st May.
>
> Width of head in third-instar grubs is three-eighths of an inch.
>
> A period of about 100 days elapses from laying of the eggs until the time to start soil fumigation.

Make Arangements for Collecting Cockchafers.

On cane areas known from past experience to be very subject to grub attack, growers should start collecting cane beetles from the foliage of feeding trees directly these insects appear on the wing.

No time should now be lost in locating the position of favourite food-plants, such as native figs, Moreton Bay Ash (*Eucalyptus tessalaris*), or others on which these cockchafers may have been seen to congregate, chancing to grow close to the headlands of their cane fields. To facilitate collecting, clear away all litter or vegetation from the surface of the ground under such trap-trees. Continue this work of collecting each day for about three weeks, dating from the beginning of the flighting period of first, second, or third emergences.

Do not be without a Spray Pump.

However small the cane farm, no grower can afford to be without the means of fighting such pests as army worms, leaf-eating caterpillars, or beetles. Such invasions are best combated at the right time—viz., when first noticed—as delay of a week or more while sending away for apparatus or chemicals often means material financial loss, which might have been avoided. For field work a knapsack pump will be found very useful on small holdings for treating army worms, &c. One having a liquid capacity of about 3½ gallons can be carried conveniently and only costs about 45s. It should be made of brass or copper, and fitted with an effective agitator and large compression cylinder, to ensure even distribution.

THE CANE-KILLING WEED.

By ARTHUR F. BELL, Pathologist; W. COTTRELL-DORMER, Assistant Pathologist.

ALTHOUGH the existence of *Striga* as a parasite of sugar-cane in Queensland has been recorded for a number of years, no detailed descriptions or illustrations have been published, with the result that the appearance and effects of the weed are still unfamiliar to most sugar farmers and technical workers in this State. Consequently, the following notes have been compiled to supplement the excellent illustrations which were executed by Mr. I. W. Helmsing under the general supervision of Mr. Henry Tryon, late Entomologist and Vegetable Pathologist in the Department of Agriculture. We are indebted to Mr. Robert Veitch, Chief Entomologist in the Department of Agriculture, for his courtesy in making available the services of Mr. Helmsing for the preparation of these plates.

History and Distribution.

These weeds are classified botanically within the genus *Striga* and are of particular interest, inasmuch as they are members of the comparatively small group of flowering plants which are parasitic upon other plants. They are fairly common throughout the tropics, occurring abundantly, according to Pearson,[5] in Tropical Africa, Egypt, Madagascar, Arabia, Ceylon, India, Siam, Java, and China. The term "cane-killing weed" is a general term applied to the members of this genus which are found parasitic upon the roots of sugar-cane in Queensland.

In South Africa one species (*Striga lutea* Lour.), commonly known as the witchweed, has been recognised as a serious parasite of the roots of maize for many years. The effects of the parasite are particularly severe if the maize is planted near the time of germination of the witchweed seeds, so that it becomes infected in the young seedling stage. The witchweed is also found as a parasite of sugar-cane in Natal, but to a much less extent than on maize.

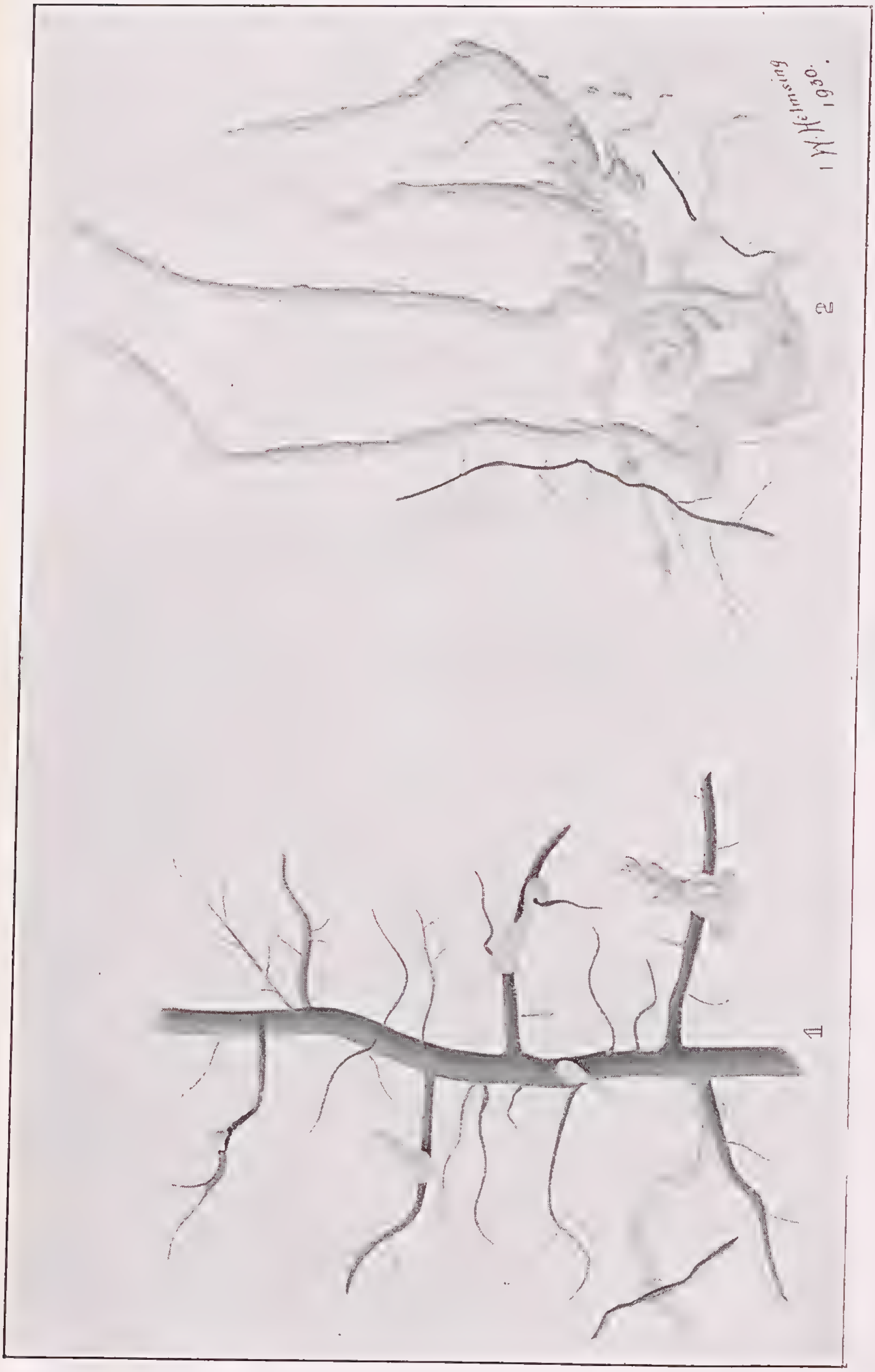


PLATE 119.

(For description of Plate, see page 473.)

Striga as a root parasite of cane was reported from India in 1921,[4] and was stated to have first been noticed in the Patiala State Territory about 1914. In 1920, reports were received of a new disease in the sugar-cane fields of the "Bet" lands of the river Sutlej. Upon investigation it was found that the cane roots were being attacked by flowering parasites, of which two were observed—namely, *Striga densiflora* Benth. and *Striga euphrasioides* Benth. In the course of the investigation, it was found that the parasite disappeared when the fields were rotated to cotton, and that therefore partial control had been unconsciously practised in the past.

This parasite is also found on sugar-cane in Mauritius, and in 1928 *Striga hirsuta* was reported as causing considerable damage on one estate.[6]

Specimens of *Striga* spp. were collected early in the botanical history of Queensland, and *S. hirsuta, S. parviflora,* and *S. curviflora* were included in an early catalogue of plants,[2] at which time they appeared to be generally distributed over the State. The first record of these plants as parasites of cane appears to have been in 1916, when Tryon[7] briefly reported *S. parviflora* as attacking cane in the Degilbo district. In 1924, the weed was found independently by Cottrell-Dormer at Carmila.[2] Since that time at least three varieties or species of the weed have been found in various parts of the Burdekin, Proserpine, Mackay, and Bundaberg districts.

We have, on several occasions, found the weeds associated with wild grasses, but in no case was any apparent stunting produced. They, therefore, are an example of indigenous parasites which have established a state of equilibrium with their hosts, but the state of equilibrium has now been disturbed by the introduction of a new cultivated host plant which has proved susceptible and allowed the parasites to gain the ascendency.

Appearance of the Disease.

As a rule the areas of infection are roughly circular in shape, with a diameter of a few yards. The damage to the crop may range from an almost imperceptible stunting, in the case of very light infection, to the premature death of the cane. In a typical case the stools are markedly stunted, with small sparse tops and clinging trash. The stunted green leaves stand out stiffly from the crown and the more recently dead leaves tend to stand out at an angle rather than hang loosely. As a result, the leaf blades present an appearance similar to the spokes of a wheel. The older leaves hang stiffly down the stalk. In common with most root diseases, the symptoms produced in the cane by these parasites are not particularly definite. The clinging trash may be responsible for the shooting of the aerial roots, but even in the recently dead canes there are no visible symptoms such as reddened fibres, &c. The root system does not appear to be reduced to any appreciable extent.

During the summer months the small weeds may readily be found in clusters at or near the base of the stools, while in some cases they may be generally distributed in the interspaces also. If a stool and the associated weeds are dug up and the soil carefully washed away, the white roots of the parasite will readily be distinguished from the dark-brown roots of the cane. Both sets of roots are much intertwined, and on careful examination it will be seen that the roots of the parasite are

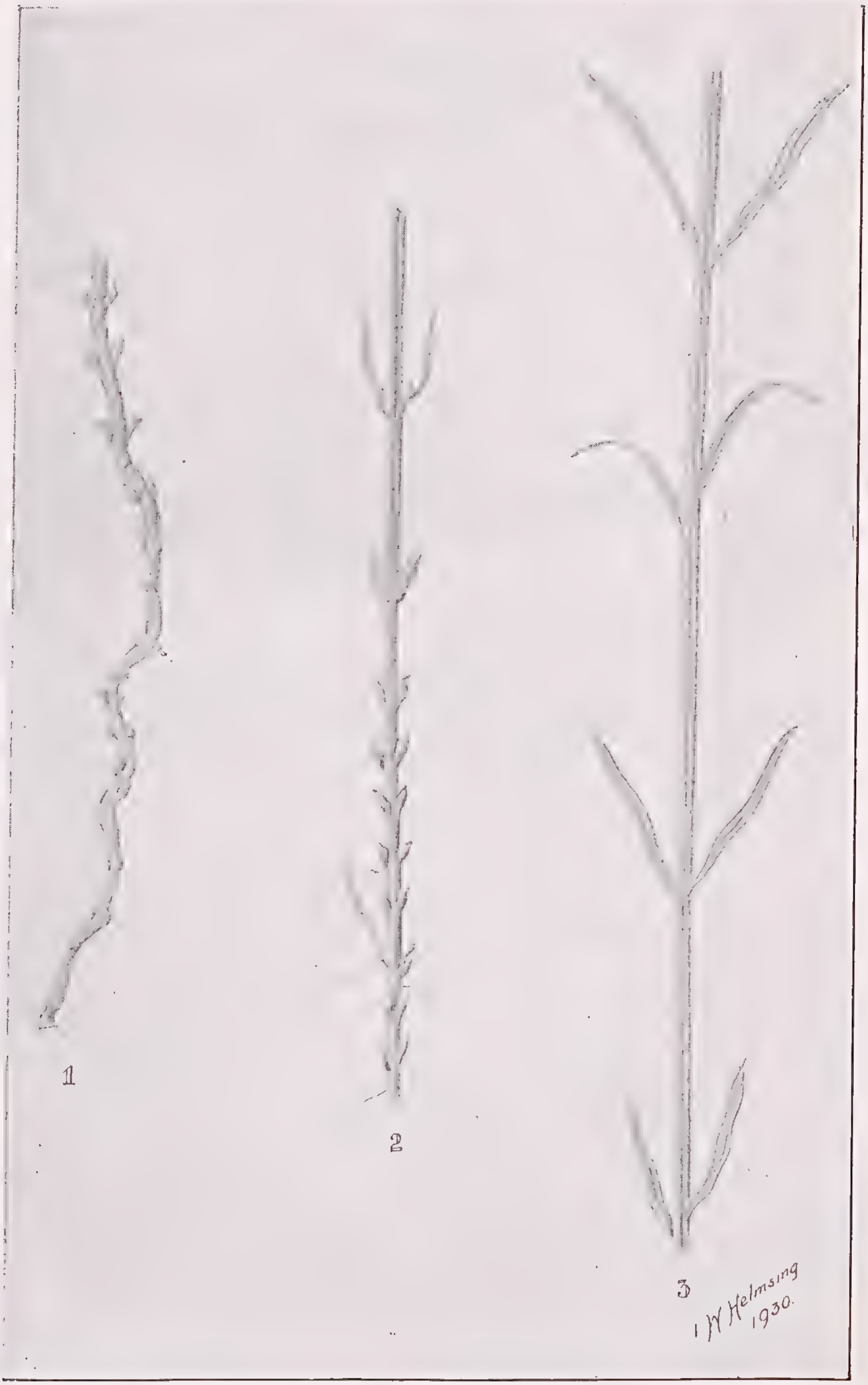


PLATE 120.

(*For description of Plate, see page 473.*)

PLATE 121.
(*For description of Plate, see page 473.*)

attached to those of the cane by means of small cup-like swellings. The number of such attachments per weed may vary from one to many.

After the death of the weeds in the autumn a careful search may be necessary before the dried bluish black plants may be found.

Description of the Parasites.

The following botanical description of the genus *Striga,* to which these weeds belong, is taken from Hooker[3]:—

"Usually scabrid herbs, discoloured or black when dry. Leaves, lower opposite, upper alternate, linear, entire, rarely toothed, sometimes reduced to scales. Flowers axillary or the upper in bracteate spikes, often 2-bracteolate. Calyx tubular, strongly 5-15 ribbed, 5-toothed or -fid. Corolla-tube slender, abruptly incurved at or about the middle or top; limb spreading, 2-lipped, upper lip usually short notched or 2-fid; lower, the inner in bud, 3-fid. Stamens 4, didynamous, included; anthers 1-celled, vertical, dorsifixed, bases obtuse, connective sometimes mucronate. Style thickened above, stigma simple. Capsule subglobose or oblong, loculicidal; valves entire, septiferous, separating from the placentas. Seeds very numerous, ovoid or oblong, reticulated. Species about 18, in the hotter regions of the Old World."

As stated above, at least three distinct weeds have been found parasitic on cane in Queensland, but owing to the rather ill-defined differences between some of the recorded species, and in the absence of type specimens, we have not attempted to identify them. The chief differences are in flower colour and habit, viz.:—

(*a*) Erect, flowers light-blue or lilac.

(*b*) Trailing on ground, flowers light-pink.

(*c*) Erect, flowers light-pink.

The general characteristics of the weeds may be studied in detail by references to Plates 119 to 124. The above-ground stems are green, circular at the base, but becoming quadrified higher up (Plate 120, figs. 2 and 3; Plate 121, fig. 4). The leaves are small, elongated, and green, the lower leaves being opposite and the upper alternate. Both stem and leaves become bluish black in colour when dried. Flowering takes place freely during the late summer; the flowers are small, sessile, and borne in the form of long interrupted spikes. The seeds are borne in small cylindrical capsules (Plate 121, fig. 6) which split longitudinally and liberate their contents. The seeds are very small (about one thirty-second of an inch long), light, and are produced in extremely large numbers. The underground portions of the stem are white, fleshy, and branched, and bear whitish scale-like leaves (Plate 119, fig. 2); the roots are light-coloured and much branched and the rootlets bear root hairs, although these are not present in large numbers.

The complete details of the life history of these parasites are not available, but, according to Pearson,[5] it is essentially as follows:—The seed falls upon the ground in late autumn or early winter and remains dormant until the early spring, when it germinates. The root of the young seedling grows out and produces small whitish spherical bodies, or haustoria; when the root comes in contact with a root of the host plant it becomes affixed thereto by these haustoria (Plate 119), which then send forth outgrowths which burst through the outer layers of the

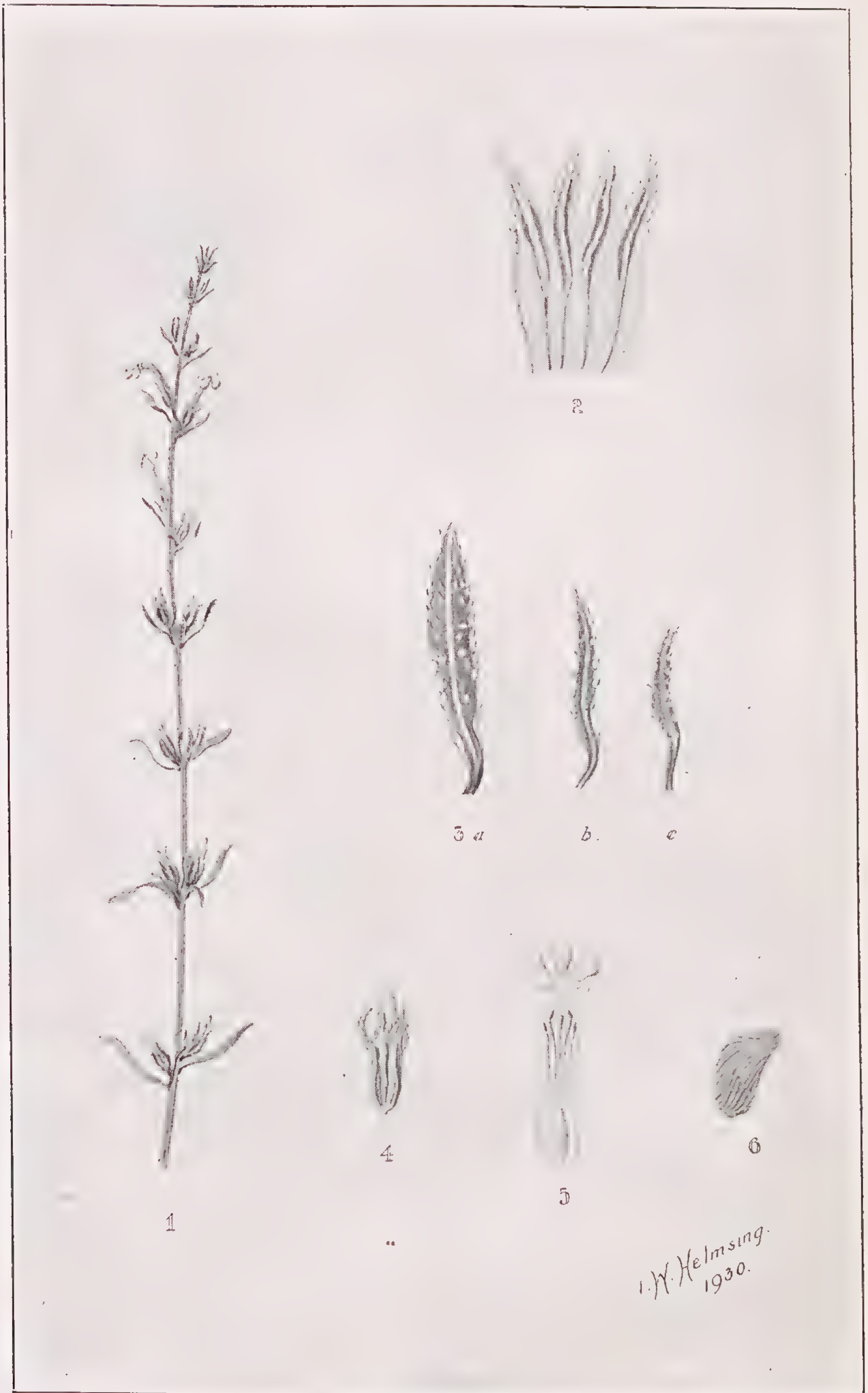


PLATE 122.
(*For description of Plate, see page 473.*)

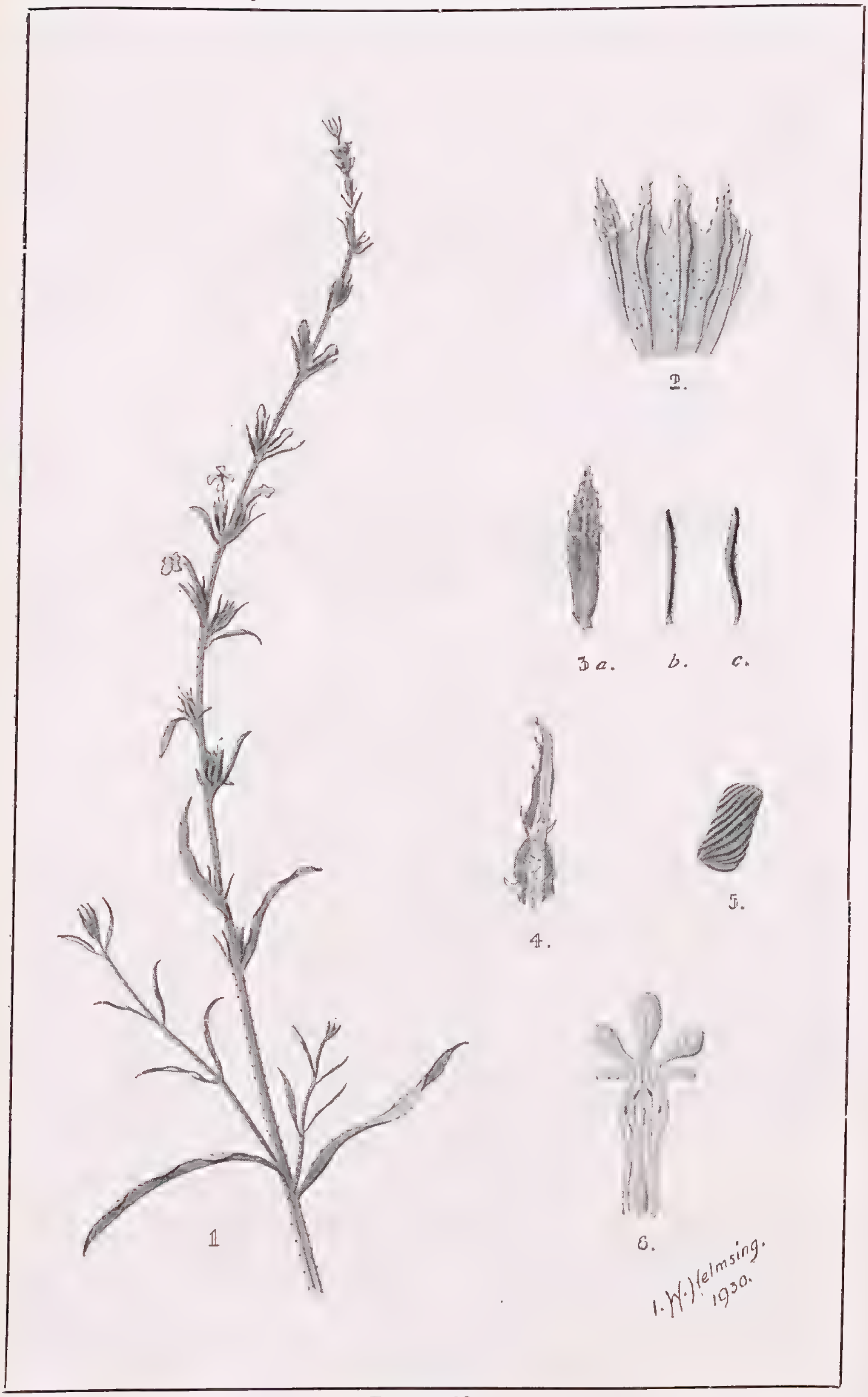


PLATE 123.

(For description of Plate, see page 473.)

root and penetrate to the vascular system. On examination of a section cut through both root and haustorium the vascular bundles of the parasite may be traced through the haustorium and outgrowths into the vascular system of the cane root, thus forming a continuous vascular system between host and parasite. In the first few weeks of its existence the parasite does not appear above ground and the leaves remain whitish and rudimentary, but once the aerial stalks appear above ground their subsequent growth is rapid.

Since the leaves are green, it follows that this parasite must be able to carry on photosynthesis during the above-ground period of its existence, and the presence of some root hairs would enable it to absorb a certain amount of water and plant foods from the soil as well as from the roots of the host plant. It must therefore be classed as a semi-parasite, at least during the later period of its existence. It is generally assumed [4 and 5] that the stunting of the cane plant is due to the loss of water and plant foods sustained by the host, but we have frequently seen cane stools 3 feet high killed by a small number of weeds the total dry weight of which would not exceed that of one or two cane leaves. In a recent outbreak on the Burdekin, in which this condition was observed, the cane had been grown under regular irrigation and had suffered no check in growth. The remainder of the field yielded 45 tons per acre, for a one-year crop, while in a patch several yards in diameter the cane had been killed when about 3 feet high. We are therefore inclined to the view that the weed must elaborate some substance toxic

Transmission and Control.

The cane-killing weed is an annual and the whole plant dies after flowering and the production of seed. It is propagated by means of these seeds, which, being small and light, are easily carried by the wind and drainage and irrigation water.

Owing to their intimate association it follows that any practice, such as poisoning, which will kill the parasite is also likely to kill the cane. If the total area attacked is not large, every effort should be made to prevent the weeds from flowering and setting seed which will infect the next year's crop. This may be effected by chipping, but owing to the fact that the underground stems are constantly sending up fresh aerial shoots it is necessary to inspect frequently and chip when required. The seeds are sensitive to heat, and the burning of trash will assist in killing all seeds above or near the surface of the ground. Where the crop is heavily infected, it is recommended that it should be ploughed out and the ground rotated to legumes, which are not attacked. Under these conditions no fresh seed will be set in that season and few, if any, of the previous season's seed may be expected to survive.

REFERENCES CITED.

1. Bailey, F. M. Catalogue of the Indigenous and Naturalised Plants of Queensland. 1890.
2. Cottrell-Dormer, W. Reports in Queensland Agricultural Journal, 1924.
3. Hooker, J. D. The Flora of British India, Vol. IV., p. 298. 1885.
4. Luthra, J. C. Striga as a root parasite of cane. Agric. Jour. of India, Vol. XVI., Part 5, pp. 519-23. 1921.
5. Pearson, H. H. W. The Problem of the Witchweed. Dept. of Agric., South Africa, Bull. No. 40. 1929.
6. Shepherd, E. F. S. Ann. Rpt. Dept. Agric. Mauritius (Botanical Section). 1928.
7. Tryon, Henry. Report of Entomologist and Pathologist, Ann. Rpt. Dept. Agric. Queensland. 1915-6.

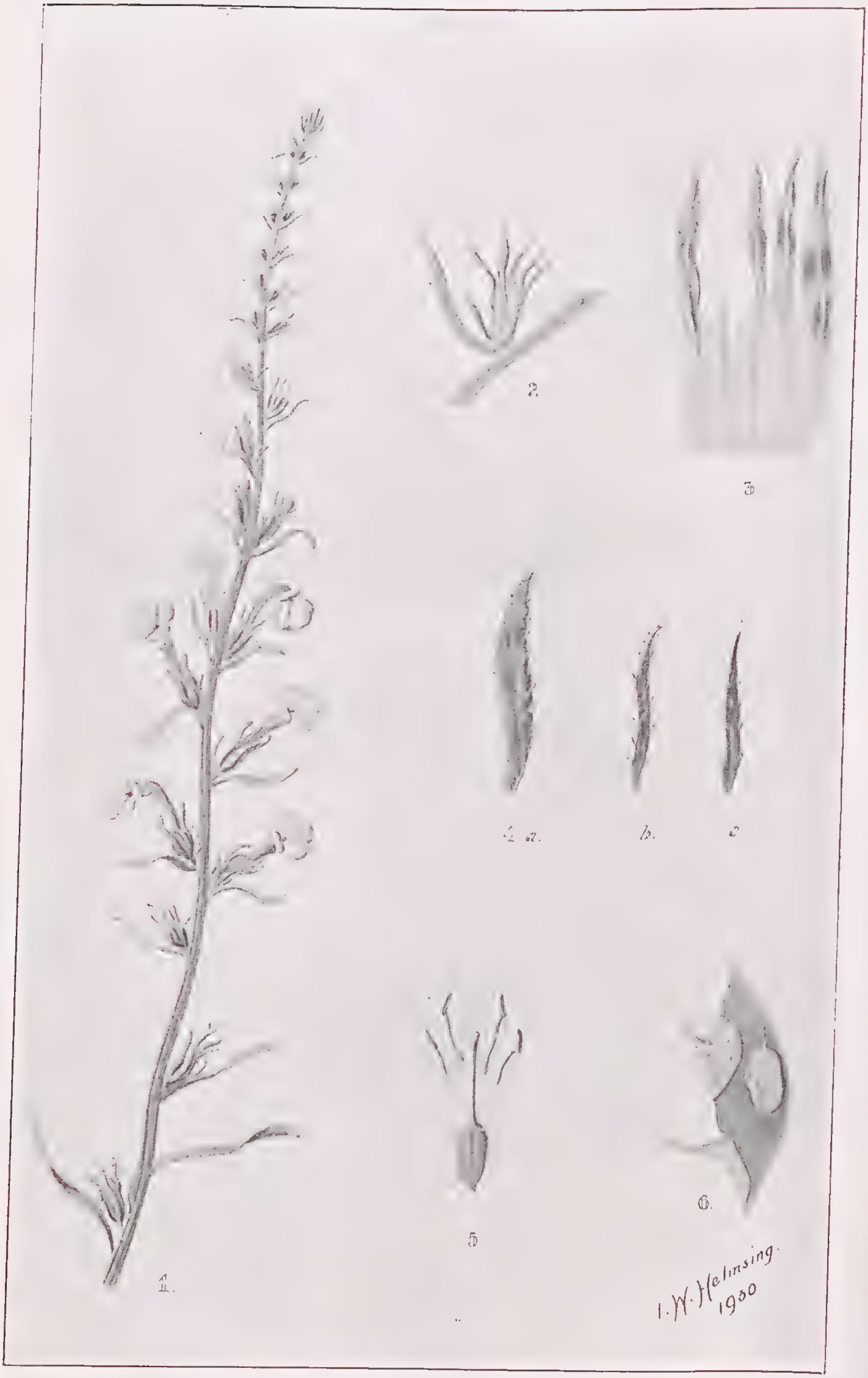


PLATE 124.

(*For description of Plate, see page 473.*)

DESCRIPTION OF PLATES.

PLATE 119.

Fig. 1.—Young seedlings attached to the roots of the host plant by means of small cup-shaped haustoria.

Fig. 2.—Parasite during underground period of existence. Note white fleshy stems, rudimentary leaves, and light coloured roots attached by means of haustoria to the dark sugar-cane roots, x 2.

PLATE 120.

Fig. 1.—Underground stem. Natural size.

Fig. 2.—Junction of underground and aerial stems; the latter is green, round, and bears elongated green leaves. Natural size.

Fig. 3.—Upper portion of aerial stem, the stem is now quadrifid and the leaves alternate. Natural size.

PLATE 121.

Specimen from Bundaberg; habit erect, flowers light-pink.

Fig. 1.—Inflorescence. Natural size.

Fig. 2.—Calyx, x 4.

Fig. 3.—a. Bract, b. & c. bracteoles, x 4.

Fig. 4.—Portion of upper stem showing quadrifid nature.

Fig. 5.—Seeds, x 17.

Fig. 6.—a. capsule, x 2; b. cross section of capsule, x 4; c. empty capsule after splitting longitudinally and liberating the seeds, x 4.

Fig. 7.—Flower, dissected to show arrangement of floral parts, x 3.

PLATE 122.

Specimen from Mackay; habit erect, flowers light-blue.

Fig. 1.—Inflorescence. Natural size.

Fig. 2.—Calyx, x 4.

Fig. 3.—a. bract; b and c. bracteoles, x 4.

Fig. 4.—Flower bud, x 2½.

Fig. 5.—Flower dissected to show arrangement of floral parts, x 3.

Fig. 6.—Seed, x 17.

PLATE 123.

Specimen from Proserpine; habit erect, flowers light-blue.

Fig. 1.—Inflorescence. Natural size.

Fig. 2.—Calyx, x 4.

Fig. 3.—a. bract; b and c. bracteoles, x 4.

Fig. 4.—Extremity of tooth of calyx. Enlarged.

Fig. 5.—Seed, x 17.

Fig. 6.—Flower dissected to show arrangement of floral parts.

PLATE 124.

Specimen from Burdekin; habit trailing, flower light-pink.

Fig. 1.—Inflorescence. Natural size.

Fig. 2.—Calyx, bract, and bracteoles, in situ, x 2.

Fig. 3.—Calyx, x 4.

Fig. 4.—a. bract; b and c. bracteoles, x 4.

Fig. 5.—Arrangement of floral parts, x 2.

Fig. 6.—Protective appendages on margin of bract. Greatly magnified.

GRASS PESTS OF THE ATHERTON TABLELAND.

By D. O. ATHERTON, B.Sc., Entomological Branch.

FOR the past ten years spasmodic reports of insects injuring pastures on the Atherton Tableland have been received by different officers of the Department of Agriculture and Stock, but not until 1929 did the urgent nature of the problem become apparent. Early in 1921, A. P. Dodd, then of the Bureau of Sugar Experiment Stations, reported a species which resembled cane grubs as a pest of the grass lands near Atherton. Damage to paspalum paddocks by white grubs was reported to this Department in 1927.

Also in 1921 Dodd reported the larva of *Oncopera mitocera* Turn. as a pest in paspalum pastures on the Tableland. From that time to the inception of the present investigation, this species has not been reported as a serious pest in the area, but an allied species, *O. intricata* Walk., has for many years past been actively destroying cocksfoot pastures in Tasmania.

Early in 1930, J. Harold Smith, the entomologist of the Department of Agriculture and Stock in charge of the Cairns Field Station, was able to report that those farms which had suffered severely from the attacks of the white grubs during the previous year showed signs of almost complete recovery. The appointment of the writer as an assistant to the Cairns office in the same year promoted the inception of a more complete survey than had hitherto been possible, and the present paper collates the information so far available.

Insects Involved.

The species concerned are active in their larval stages as pests of pastures, and they fall into two distinct groups—the white grubs, family Scarabeidæ, and the grass grubs, family Hepialidæ. There are a number of species in the former group, and, according to Dr. Jefferis Turner, two, perhaps three, in the latter. In the case of the white grubs, the whole of the larval life is spent in the soil, whereas the grass grubs shelter in tunnels therein, but emerge to feed on the selected host plants. Each of the two groups of insects thus enjoys a certain but different measure of protection from natural enemies. There is a great difference in the mode of injury; the Hepialids feed on the flaggy parts of the grass, while the Scarabeids feed on the roots below ground level. It would appear that all the species involved are indigenous to the rain forests of the area, feeding on pasture grasses being an acquired habit evolved to meet the changed conditions initiated with the felling of forests for dairying purposes.

WHITE GRUBS.

Many scarabeids are classed as white grubs by the lay mind, but only a few are known to definitely injure pastures, while the remainder do no apparent harm. Of the injurious species, two concern the Tableland farmer. One, *Lepidiota caudata,* is common round about Malanda, while the other is responsible for pasture losses in and around Atherton. The latter insect is at present unnamed, and in the early larval stages is difficult to separate from *L. caudata,* though the adults are quite distinct.

The regional limits of each require working out in detail, but the generalisation already made is sufficiently definite for ordinary purposes.

Of the non-injurious species, *Dasygnathus australis* Boisd. is common in Tableland pastures, while *Neso flavipennis* Macl. has been collected on six farms. Heteronyx and some four or five other species occur in small numbers, but never in circumstances which would associate them with pasture destruction.

All the identifications have been based on larval characters in the first instance, later supplemented by collections of the adults during the flight season in the case of the two principal pests. Where such confirmation is wanting, the characters of the larval head and anal tract are taken to be sufficiently distinct to allow specific reference.

The life histories of the two white grub pests are very similar, and for the purposes of this discussion *Lepidiota caudata* is considered in some detail.

Lepidiota caudata Blackb.

Injury.

This species is very probably indigenous to the Tableland and considerable numbers may exist in a pasture before being noticed. Field symptoms normally appear during the autumn and winter, when the grass is less vigorous than at other times of the year. Injury takes the form of roughly circular patches which gradually extend in area, the grass becoming brown and finally dying out. In a typically severe case the patches extend until as much as 90 per cent. of the field may be affected, but in lesser attacks the damage is often localised to the vicinity of old logs and stumps which encumber the ground. The flight habits of the beetle may cause this phenomenon, for adults on the wing strike the obstruction, fall to the ground, and lay their eggs on the spot. In heavily infested pastures, the soil becomes wholly granulated, for, when feeding, the larvæ pass soil through the alimentary canal and void it in small pellets. As many as 146 larvæ have been taken less than 6 inches deep over an area of 1 square yard. In such a case, the grass is destroyed and can be raked from the surface with the fingers.

Life History.

According to Dodd, *L. caudata* has a two-year life cycle, comparable to that of *L. frenchi* Blackb., a cane pest of some importance. The adult beetles, dark-brown in colour, are on the wing during the early weeks of the wet season and apparently lay their eggs in isolated places, for outbreaks usually commence at various centres in the one paddock and spread as the food requirements of the young necessitate. Unless the population is considerable, pasture destruction is not apparent until the second year of larval life, when the appetite of the insect is voracious. The growing larval stage is completed in September of the second year and is succeeded by pupation at a considerable depth in the soil. Pupation may last two or three months, the period being determined by the advent of the summer rains, which have considerable influence on the emergence of the adult.

Distribution and Bionomics.

Damage by white grubs would appear to be confined to the older pastures of the Tableland. All cases in which *L. caudata* is the harmful agent have been pastures of at least fifteen years' standing. The one

farm on which a younger pasture has suffered was but ten years old when the first sign of the white grub trouble was noticed by the farmer, but there is some doubt here concerning the identity of the pest.

The influence of the aspect of the pasture or its proximity to primeval rain forest on white grub infestation is almost unknown. It is just possible, however, that land swept by prevailing winds passing over rain forests is slightly more susceptible to the pest. Presuming the prevailing wind to be from the south-east, those fields with a south-east aspect may be more likely to stop the flight and receive the eggs of the gravid females. These are mere presumptions, however, for which there is little evidence. It is uncertain that beetles make long flights, and the suggestions do nothing more than indicate the problems which may be better explained by subsequently disclosed facts.

Plant Succession in Damaged Pastures.

When a stand of grass has been weakened through any cause whatever, other plants tend to make their appearance. A very striking illustration of such a succession was observed in a field showing the symptoms of white grub infestation. The paspalum in the bulk of the field was an almost pure stand, isolated plants of *Cnicus lanceolatus* (Scotch Thistle) and flannel weed being the only weeds. The distinctively brown patches were accentuated by a much more varied flora, including *Ageratum conyzoides* (Goat weed), *Tagetes glandulifera* (Stinking Rodger), *Acanthospermum hispidum* (Star Burr), *Sida* spp., *Oxalis corniculata* (Sour grass), and *Sporobilis indicus* (Rat's tail grass) in addition to the two previously mentioned. A more advanced stage was seen in another field which when examined had been isolated from stock for six to eight months, and two years before was badly infested with white grubs. *Tagetes glandulifera* and *Solanum auriculatum* (Wild Tobacco) were the dominant species, while occasional seedlings of *Amelia composita* (White Cedar) were just beginning to make their appearance. The latter field was well on its way to reclamation by the original rain forest formation.

The above is an extreme example, as, in most cases, succession is neither so rapid nor complete. Weeds are very likely to be of some importance in the decline of pastures initiated by white grubs, but they are readily overcome by a healthy pasture.

In addition to the foregoing, a number of species are met with more or less regularly, viz., grasses—*Paspalum platycaule* (Buffalo couch), *P. conjugatum* (Yellow grass), *Cynodon dactylon* (Couch grass), *Eleusine indica* (Crowsfoot grass), *Panicum sanguinale* (Summer grass), *Paspalum galmarra* (Russell River grass); and weeds—*Malvastrum tricuspidatum*, *Phytolacca octandra* (Ink weed), *Bidens pilosa* (Cobblers' pegs), *Amaranthus spinosus* (Needle burr), *Euphorbia pilulifera* (Asthma plant), *Richardsonia scabra* (White eye), *Triumfetta rhomboidea* (Chinese burr), and *Verbena officinalis* (common vervain).

Natural Recovery.

In some circumstances pastures which have been seriously affected with the white grub pest are able to recover, even though subjected to heavy stocking. There are paddocks on at least three farms where this has occurred. In each the paddocks were denuded of grass during the dry weather of the years 1928 and 1929. The soil was in a granulated

condition and stock or people walking across the land sank through the crust to a depth of several inches. Stock have since been running on each of the fields continually, yet during the months of July and August, 1930, there was good feed on all. However, the ground still showed an uneven surface caused by grazing stock during the months of infestation. In the opinion of some of the farmers, the thorough granulation of the soil following white grub infestation has had a beneficial effect in promoting the growth of healthy and more vigorous pastures.

Natural Controls.

The fact that the larvæ are confined to the soil, as previously mentioned, militates against any great measure of control by natural enemies. Nevertheless, there are a number of agents which exert some restriction on the indefinite increase of the pest. These include—

(*a*) Other Insects.—The entomologists of the Bureau of Sugar Experiment Stations noted that wasps of the family Scoliidæ attack cane grubs, and it seemed reasonable to suppose that they also parasitise white grubs in pastures. There is, however, no evidence to support this, though adults have been seen on the wing occasionally. Large numbers of grubs were handled in the course of this work, but no signs of parasitism by Scoliids or any other insects were found.

(*b*) Pathological Disorders.—Occasionally larvæ when collected are blackened and flaccid with disease. On one farm the number of such diseased specimens reached 4·2 per cent.

(*c*) Animal Predators.—Some farmers contend that bandicoots prey actively on white grubs, but the value of these marsupials in reducing the white grub population must be regarded as slight. The black ibis is certainly an active enemy. Thus in one field twenty-three birds were spread over some 4 square chains scratching through the dead grass and feeding on the grubs. Brolgas or native companions also feed voraciously on the grubs in a similar manner to the ibis. Unfortunately, the good work of both birds comes at a time when the pasture has been almost entirely destroyed, hence their usefulness is confined to a depletion of the potential beetle fauna which the grub population represents.

(*d*) Climate and Weather.—There is no evidence to show that mild frosts such as occur on the Tableland have any influence on the severity of grub infestation. Heavy rains sometimes depopulate certain low-lying areas, for should the soil be saturated for some days, the grubs are forced out of the soil and are drowned. Good winter rains are indirectly beneficial, for the increased vigour of the grass helps pastures to overcome any setback due to the partial destruction of their root systems by the grubs.

Practical Remedies.

Owing to the habits of the larvæ, the only possible means of applying an insecticide would be as a soil fumigant. This method is both impracticable and uneconomic for the treatment of pastures, hence attention could be better given to the utility of biological control and cultural practices. There is little information available about the former, but changes in cultural practices have already been effected by several farmers.

Throughout the area, it is customary to give no further attention to the paspalum pasture once the turf is established, yet its stock-carrying

capacity is expected to remain consistently high. Actually it deteriorates fairly rapidly, and two common evils—over-stocking and continuous stocking—hasten the process, quite apart from the effect of occasional white grub infestation. There is some evidence to show that a periodic spelling of the paddock has a beneficial effect. Thus several properties, practically denuded of grass in 1929, carried a very healthy and substantial body of feed the following year, the result of resting the paddock for several months.

A number of men have advocated the cultivation and breaking up of the matted paspalum roots as a remedial measure. Some have used a special tine cultivator, but most merely turn the land over with the plough late in the year. In either case the method entails a certain amount of expenditure in clearing the land of any logs or stumps. Cultivation is generally feasible on the inside—i.e., the country north and west of Malanda—but the majority of the farms in the districts about Tarzali and Millaa Millaa are on broken country where such measures would be impracticable. The majority of the farms which have been cultivated were first worked only two or three years ago and, for the most part, the results are quite satisfactory. When cultivation is proposed, it is advisable to work the land during the storm season in November and December. The plants will then readily strike root and a new pasture cover will be available within a few months. Such pastures should only be lightly stocked until the first flush of grass has shed its seed and the sward is tolerably complete.

Another cultural method adopted by one or two men takes the form of grazing pigs on grubby land—following the American practice of hogging off on maize lands infested with white grubs. This procedure has much to recommend it. The pigs tear up the ground and thus loosen and aerate the soil, at the same time disturbing the root-bound condition of the paspalum; they feed on the white grubs, thus destroying a potential brood of beetles, while this addition to their diet conditions the animals very rapidly.

GRASS GRUBS.

So far as the present inquiry goes, there appears to be but one species involved, though Dr. Jefferis Turner says that there are at least two, and probably three, moths of the genus *Oncopera* recorded from the districts concerned.

Oncopera mitocera Turner.

The advent of this species as a pest to the Tableland was described by Dodd in 1921, and, unfortunately, it appears that little can be added, at this juncture, to what he has already written.

Injury.

The leaf blades and stems of the grasses are eaten by the larvæ and the surrounding earth littered with frass; this latter condition is very distinctive. During a heavy infestation the ground is practically bared by this scourge, and patches several square yards in area are totally denuded of grass. Damage is likely to occur at any time of the year, though when it comes in the winter months the position is made more serious owing to the seasonal shortage of feed common at that time. The same farm may suffer year after year, and the effect on the output is consequently severe. Paspalum pastures are held by some farmers to

become more susceptible to *Oncopera* attack when allowed by spelling to produce a long flaggy growth a foot or more in height. This view possibly depends on the fact that the larvæ of *Oncopera* cut away the stem of the grass at ground level and the top quickly dries up—emphasising the activity of the pest and its mode of operation. The grass may then be raked off the surface and the ground below is found to be bare save for pieces of rotting grass and the frass of the marauder.

Life History and Habits.

Moths are on the wing in large numbers between the months of January and April. Eggs are distributed freely among the grass, and larvæ may be collected from July to December, and then vary in length to a maximum of over 2 inches. Pupation takes place in the larval burrow from December to March at a depth of 4 to 6 inches.

In the later instars, the larvæ are very different from those of the earlier instars, not only in size but also in structure and in the depth of colouring. Whereas in the early stages the anterior surface of the head presents a decidedly flat appearance and is bounded round the antero-lateral edges and vertex by a continuous semi-circular ridge, the older larvæ have the head normal and convex in its anterior aspect, without lateral regions or vertex ridged. Later instars are very much lighter in colour, with head and thorax light-brown and abdomen very light-green or creamy; early instars have head and thoracic sclerites black and abdomen dark-green.

The more or less vertical burrows excavated by the grubs may be from less than 6 inches to more than 15 inches in depth, the last 3 or 4 inches being unlined with silk. The larvæ may construct a chamber in the burrow just below the surface of the ground which possibly facilitates turning when excavations are in progress. The soil is apparently collected from the base of the extending burrow and held in the mouth-parts as the larva backs into the chamber, in which it turns before carrying the burden outside. Burrows constructed on pasture land, particularly in situations where the grass is short, are frequently left unprotected at the surface. In many cases where the grubs are sufficiently numerous to be regarded as pests, the silk lining of the burrow merely projected some ¼ inch or ½ inch above the surface of the ground. The top inch of the burrow was very often inclined away from the vertical and, if on a slope, usually faced down the hill. It is commonly found that in pastures with a fairly long growth, anything from 3 inches upwards, the larva builds a sort of anteroom over its burrow. Here the usual burrow is brought to within ½ inch of the surface and there flared out like the top of a test tube. Built over the top of this was a covering consisting of pieces of earth and dead grass. The cavity is about 1 inch to 1½ inch long and two-thirds this distance in width. This little hollow below the burrow opening is usually filled with frass and feeding reserves. The whole of the cavity is lined with silk, and a passage-way of similar material leads away from it in a horizontal direction. Despite careful search in the rain forest for an analogous structure, no trace of such has been found, and it appears to be therefore peculiar to pastures with a fairly heavy sward.

An average of twenty to twenty-five burrows per square foot was found to be common in a heavily infested area and, under such conditions, it is not unusual for the ground to be bared of grass.

Larvæ in the rain forest live in burrows with unprotected entrances. Here they feed on fallen leaves, in particular those of the strangling fig (probably *Ficus Watkinsonii*). These fallen leaves, though yellow to some extent, are usually succulent for some time after they fall to the ground; but dry leaves and even soft wood may be taken by the insect.

Distribution and Bionomics.

This is most certainly an indigenous species in the local rain forests and may be found, though not always as a pest, on almost any holding from Yungaburra to Evelyn. Eight to ten years ago it was commonly found as a pest of paspalum round about Yungaburra from Kulara to Kureen. Now, however, it does not cause the farmers serious worry outside the Millaa Millaa district. Reports of severe damage by *Oncopera* were received from six only of the farms visited during the past two years, but the pest has been located on many others in various parishes from Yungaburra to Evelyn. Eight to ten years ago it was commonly in the vicinity of affected pastures.

These grass grubs have been taken on pastures of widely different ages, varying from six to eighteen years. Those farms on which the infestation has been very bad during recent years are on the edge of a large tract of rain forest which clothes the Cardwell Range between Ravenshoe and Millaa Millaa. There seems to be abundant evidence to show that damage from *Oncopera* grubs is intimately related to the mutual proximity of farm lands and unfelled rain forest.

Practically all grasses in the more recently established pastures, whether these be intentionally or unintentionally present, are attacked by the grubs. The more favoured ones include *Pennisetum clandestinum* (Kikuyu grass), *Paspalum platycaule* (Buffalo couch), *P. dilatatum* (Paspalum grass), and *P. conjugatum* (Yellow grass). In one field where all these grasses but the last were growing, *P. platycaule* suffered most severely, but there appears to be no consistent preference for any one grass.

Succession and Natural Recovery.

Oncopera-attacked pastures rarely show the floral succession described in the white grub discussion, though chickweed may flourish in the region of logs and scrub boundaries where the pest has been operating.

If the pest attacks a pasture year after year, the root system of the grasses apparently suffers. On one property which had been grassed for twelve years, and which had been attacked for the past six years, there was no root-bound condition such as would normally characterise a pasture of that age. It is presumed that the proliferation of new shoots following *Oncopera* attacks so drains the vitality of the plants that normal development of the root system is partly inhibited. In cases where there has been no *Oncopera* attacks for some years, even though previous attacks have been severe (there are a number of such farms in the Peeramon district), there is no apparent residual effect on the pasture. Once the infestation ceases to be noticeable, the grass recovers quite rapidly and there appear to be no harmful after-effects.

Natural Controls and Practical Remedies.

There has been no evidence to show that either parasites or micro-organisms are active as controlling agents. Various native birds probably feed on the grubs and moths to some extent. Local opinion asserts that

the common black ibis is a beneficial factor in the decimation of grass grubs, the birds reaching the grubs in their burrows by the insertion of their beaks. Floods and heavy rains are also held to account for large numbers of grubs which would otherwise reach maturity.

As yet no practical measure for dealing with the pest has been devised. It seems unlikely, judging from the absence of success in Tasmania against *O. intricata,* that insecticides will prove of material value. The trouble is apparently bound up with the proximity of rain forests to the farms, and it is hoped that as development on the Tableland proceeds the losses to dairying due to this cause will be materially reduced.

Conclusion.

It is hoped that this report will serve as a reasonably accurate statement of the present position regarding the two major grass pests on the Atherton Tableland. Both grass grubs and white grubs have caused justifiable concern to many farmers, and it is hoped that improved cultural methods and better pasture management will help to counter the losses which would otherwise be inescapable.

SUMMARY.

For the past ten years, intermittent reports of spasmodic outbreaks of insect pests in the pastures of the Atherton Tableland have been received by the Department of Agriculture and Stock. These indicated fairly widespread damage in 1928 and 1929. The insects involve two groups—white grubs or species of Scarabeidæ, and grass grubs or species of Hepialidæ. Of the white grubs, *Lepidiota caudata* Blackb. appears to be the only important pest near Malanda, while a second unidentified species attacks pastures at Atherton. The injury, distribution, life history, and bionomics of the first have been outlined and remedial measures discussed.

Less is known of the grass grubs, but one species (*Oncopera mitocera* Turn.) has been similarly treated so far as the available information will allow.

Acknowledgments.

It is desired to thank the officers of the Bureau of Sugar Experiment Stations at Meringa for assistance in the identification of white grubs, the Instructors in Agriculture at Atherton for help in transportation, and the various dairying interests on the Tableland, who have always co-operated in the field work incidental to these investigations.

LITERATURE.

Dodd, A. P. Q. Bur. Sug. Expt. St., Div. Ent. Bull. No. 6. 1917.
Dodd, A. P. Q. Agr. Jl. 1921.
Illingworth, J. F. Q. Bur. Sug. Expt. St., Div. Ent. Bull. No. 15. 1921.
Hill, G. F. C.S.I.R. Pamphlet No. 11. 1929.

THE LEAF-EATING LADYBIRD.*

By ROBERT VEITCH, B.Sc., F.E.S., Chief Entomologist.

THE ladybird beetles or Coccinellidæ constitute one of the most important families of insects, largely on account of the fact that the great majority of their species are carnivorous, beneficial insects, feeding, in both their larval and adult stages, on aphids and scale insects. There is, however, one small group of the ladybirds, members of which are phytophagous—i.e., they feed on plant tissue. This group is known as the Epilachninæ, and is represented in Australia by two species that are quite commonly met with, namely, *Epilachna 28-punctata* Fab. and *Epilachna guttato-pustulata* Fab. The former is decidedly the more important of the two, and it is the species that is generally referred as the leaf-eating ladybird.

The leaf-eating ladybird has a wide range of food plants, and in Queensland it commonly attacks potatoes, tomatoes, and pumpkins. Rock-melons and cucumbers are also attacked, and it may frequently be found feeding on nightshade (*Solanum nigrum*), which is also a weed host-plant of another potato pest, namely, the potato tuber moth. The trumpet flower (*Datura stramonium*) is another weed on which this ladybird may commonly be found feeding.

NATURE OF INJURY.

The damage inflicted by this beetle is due to the feeding of both the beetle and the larva of the species, the former feeding freely on the upper and lower surfaces of the leaves, while the latter concentrates its attention on the lower surface. The larva feeds in a very characteristic fashion which is well depicted in the accompanying illustration (Plate 125, fig. 5). It eats a fairly long narrow strip of tissue on the underside of the leaf, but in doing so it does not eat completely through to the upper surface. It then cuts a second strip alongside the first one, the two strips being separated from each other by only a very thin ridge of uneaten tissue. The process is repeated again and again until a comparatively large ragged patch is eaten out of the underside of the leaf, only the thinnest layer of tissue being left intact on the upper surface. The beetles may eat right through the tissue of the leaf.

In recent epidemics this pest has been present in such numbers that the foliage in many cases has been practically destroyed, and even the stems of the attacked plants have been seriously injured. Where extensive injury is inflicted on the foliage there must obviously be a very much reduced yield of the edible product of the plant attacked, i.e., the potato tuber, the tomato fruit, or the pumpkin.

LIFE CYCLE STAGES AND LIFE HISTORY.

The yellow eggs (Plate 125, fig. 1) are laid in clusters on the foliage, the number laid in each cluster in the field having varied from 13 to 45 during a recent outbreak of this pest. The eggs are typical ladybird eggs, being elongate oval in shape and measuring about $\frac{1}{6}$ inch in length.

---

* Reprinted from "Pests and Diseases of Queensland Fruits and Vegetables" by Robert Veitch, B.Sc., F.E.S., and J. H. Simmonds, M.Sc. Published by the Department of Agriculture and Stock, Brisbane, 1929.

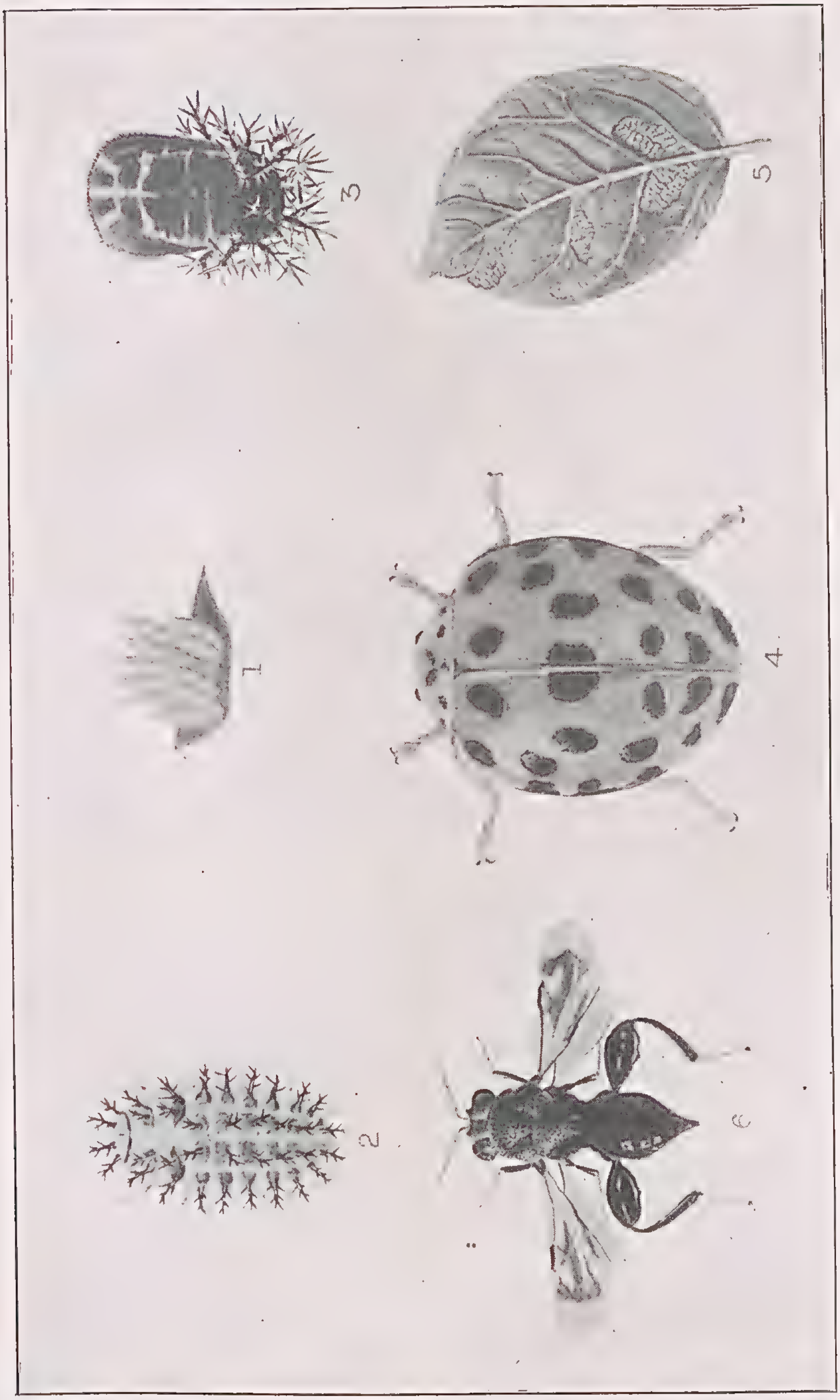


PLATE 125.—THE LEAF-EATING LADYBIRD (*Epilachna 28-punctata* F.)

Fig. 1, Eggs x 5; Fig. 2, Lava x 5; Fig. 3, Pupa x 5; Fig. 4, Adult x 8; Fig. 5, Injury; Fig. 6, Parasite x 8.

(*From a water-colour drawing by I. W. Helmsing*).

The surface of the egg is beautifully reticulated, but such a detail can be observed only with the aid of a lens. The eggs are glued to the foliage at their broader ends. The incubation period during the outbreak already mentioned was four days.

The larva (Plate 125, fig. 2) is a most extraordinary spiny-looking creature, and when full-grown it measures about $\frac{1}{3}$ inch in length. The under surface of the body is yellow in colour, while the upper surface is similarly coloured except for the fact that the yellow colour is broken by rectangular brown areas at the base of the many-branched spines which give the larva its awe-inspiring aspect. The larva possesses three pairs of legs. The larval period lasts for about three weeks, and during that growth period it moults four times.

The pupa (Plate 125, fig. 3) is about $\frac{1}{4}$ inch in length, and may be found securely fixed to the leaf, stalk, or main stem. A conspicuous feature of this pupa is the fact that the last larval skin, moulted when pupation takes place, is attached to the abdominal extremity of the pupa. The pupa itself possesses dark-brown markings broken by creamy-coloured patches. The pupal period during the warmer months in Queensland has been found to extend to only four days.

The oval-shaped beetle (Plate 125, fig. 4) is about $\frac{1}{4}$ inch in length and is yellowish brown in colour. The wing covers bear a number of very conspicuous black spots, whence the name *28-punctata* is derived. The number of these spots is not, however, constant, and they may vary from 12 to 14 on each wing cover. In occasional specimens the yellowish-brown body colour is replaced by a much darker shade which gives the beetle a very dark brown appearance, and in these specimens the black spots do not stand out so conspicuously as in those that are normally coloured. Like other ladybird beetles, this species excretes an unpleasant evil-smelling, yellowish fluid when it is handled. Recent life-history investigations by Miss Temperley showed that in the laboratory the female beetle may lay as many as 252 eggs.

Control Measures.

Outbreaks of this pest are fortunately not long-lived, but while they last they may be very severe. Experience has shown, however, that it yields readily to treatment with arsenical sprays. Whenever it is noticed becoming abundant on the foliage of any of its host plants of economic importance, steps should be taken to spray the same with arsenate of lead. Dusting may be adopted as an alternative to spraying.

Natural Enemies.

A hymenopterous parasite, *Stomatoceras colliscutellum* Gir. (Plate 125, fig. 6), occurs in the pupæ of this pest, and it may be of some little service in limiting the abundance of the insect, but it is not thought to be at all effective as a control factor. Miss Temperley, in the course of recent life-history studies of this pest, was led to suspect that the very widely distributed and much maligned little ant, *Pheidole megacephala* Fab., was responsible for the destruction of many of the eggs of the leaf-eating ladybird. Certainly in several countries to which this small ant has been introduced it has exercised a high degree of influence on the native insect fauna, and it may be that in Queensland it is including the leaf-eating ladybird in the list of insects suffering from its presence.

EXPERIMENTS WITH A NEW FRUIT FLY LURE.

By HUBERT JARVIS, Entomological Branch.

THE trapping of fruit flies (Trypetidæ) by means of attractive odours or lures, was first practised in Queensland about 1914, but it had long been realised by entomologists in other countries that certain species of fruit flies reacted to specific odours.

In 1909, W. W. Froggatt recorded the attraction to citronella oil of the male only of the mango fruit fly (*Dacus ferrugineus* F.) and mentioned that when in India he was able to take hundreds of the flies with one sweep of a fly net over foliage on which the oil had been sprinkled. C. W. Mally, in South Africa, also found in 1909 that paraffin oil attracted the Mediterranean fruit fly (*Ceratitis capitata* Wied.). Following on C. W. Mally's work C. P. Lounsbury recorded the fact that both sexes of the Mediterranean fruit fly were attracted to paraffin oil, the males greatly predominating. F. M. Howlett, in India in 1912, discovered that the males of the peach fruit fly (*Dacus zonatus* Saund.) were strongly attracted to citronella oil, and E. A. Back and C. E. Pemberton, in 1914, demonstrated in Hawaii that many oils derived from crude petroleum, and also certain vegetable oils, attracted the males of the melon fruit fly (*Dacus cucurbitæ* Coq.) and the Mediterranean fruit fly (*Ceratitis capitata* Wied.). Later L. J. Newman, in 1923, was successful in trapping large numbers of fruit flies in Western Australia with a pollard and water bait. The species concerned in this case was the Mediterranean fruit fly, both sexes being attracted.

In 1914, Mr. A. W. Harvey, of Queensland, evolved a lure with which he was successful in trapping the males of the Solanum fruit fly (*Chætodacus dorsalis* Hendel), an innocuous species, and after further experiment he produced a lure which attracted the male of the Queensland fruit fly (*Chætodacus tryoni* Frogg.) and later the female also of this species. The Harvey lure has been successfully used in Queensland orchards.

Stanthorpe Experiments.

During the last five years tests of the olfactory reaction of fruit flies to various oils and vegetable essences have been made with varying success by the writer, and it was found that the Queensland fruit fly, which is the most destructive species in this State, was indifferent to any of the odours that were so attractive to other fruit flies elsewhere.

In 1928 the writer formulated a lure which was successful in attracting both sexes of the following species of fruit flies:—(1) The Queensland fruit fly (*Chætodacus tryoni* Frogg.); (2) the Jarvis fruit fly (*Chætodacus jarvisi* Tryon); (3) the small black fruit fly (*Dacus niger* Tryon); (4) the Solanum fruit fly (*Chætodacus dorsalis* Hendel); (5) the boatman fruit fly (*Rioxa musæ* Frogg.); and (6) the Mediterranean fruit fly (*Ceratitis capitata* Wied.).

The lure, which is a combination of imitation vanilla essence, ammonia, and water, was found to be particularly attractive to the Queensland fruit fly, and to the Mediterranean fruit fly, the latter in New South Wales, where it was tried out during the season 1928-29 by Mr. F. Chilton, of Sydney. During the season 1929-30 this lure was used with much success by many orchardists in the Stanthorpe district, and also in the Toowoomba district.

As the lure was considerably cheaper than any then on the market, and was easy of manufacture by the orchardists themselves, and as,

moreover, the general concensus of opinion indicated that luring was considered a control measure of definite value, it was decided to test the new lure in comparison with the only other lure on the market, this having been hitherto practically exclusively used, and the results obtained during the 1929-30 and 1930-31 seasons are tabulated in this report.

Details of Experiments.

Two orchards situated one at the northern and the other at the southern end of the Stanthorpe district about 12 miles apart were chosen for the work.

In Orchard No. 1 sixty traps were used in both seasons, and in Orchard No. 2 thirty-eight traps were used in the 1929-30 season and forty-eight in the 1930-31 season. An equal number of traps was used in each orchard for the respective lures. The area under fruit trees was in each case about 20 acres, comprising pomaceous and stone fruits of both early and late-maturing varieties.

The traps used to contain the lures were the ordinary commercial glass-bowl fly traps, retailed at about 1s. 9d. each. They were hung in the trees by means of strong wire twisted around the neck of the trap and bent into a convenient hook at the end. The lure was renewed as required. In normal summer weather weekly rebaiting was generally found to be sufficient, but exceptionally drying conditions or the upsetting of traps by high winds often necessitated a more frequent renewal of the lure. Furthermore, the lure in traps set in trees of a fairly open growth evaporated more quickly than in those traps that were placed in the more shady trees. The traps containing the respective lures were suitably marked to avoid confusion, and they were replicated each week—i.e., the traps containing one lure being placed in the situation occupied by the traps containing the other lure, and vice versa. This was done because it has been repeatedly observed that certain situations in an orchard are always more favourable for fruit fly congregation, owing to shelter from wind, or the presence of large, leafy trees in such situations which are always more attractive to fruit flies than are trees of a smaller and more open growth. Thus, by weekly change of the position of the traps containing the different lures, each was given as equal a chance as possible.

The flies were removed from the traps and counted by the orchardists concerned, the catch from each lure being placed in marked bottles. A check count was then made, and the sexes represented in each case were separated and the females examined for egg development. No count was made of flies other than fruit flies nor of the number of eggs contained in individual female flies. The amount of liquid used in each trap at a setting was approximately 6 oz.

It was found that both lures would keep at the solution mentioned unimpaired for twelve months.

The Harvey lure was supplied direct from the maker, in 1-gallon tins, and was used as directed, at a strength of 1-5.

The cost figures given in Table 3 are based in the case of Harvey lure on the Brisbane wholesale price charged by the maker for this lure, and in the Jarvis lure on the wholesale prices of houeshold ammonia and imitation vanilla essence.

Formula of Jarvis Lure.

The formula used in the Jarvis lure throughout the experiments was imitation vanilla essence $\frac{1}{8}$ oz., household ammonia $\frac{1}{2}$ oz., water

26 oz. This was supplied to the orchardists in 26-oz. bottles, at a five to one strength. They were also given the formula to enable them to make the lure if necessary.

Seasonal Infestation of Fruit Fly.

During the season 1929-30 there was a comparative freedom from fruit fly attack throughout the district; in fact, in this respect it was the most notable season for eight years. The figures in Table 1 show the relatively small number of fruit flies trapped in the experimental orchards during the period mentioned. The very gradual increase of fruit fly during the season, reaching its maximum in February, would appear to indicate that the quota of flies in 1929-30 originated from local increase rather than from the immigration of fruit flies from outside areas.

In the season 1930-31, however, the appearance of fruit flies in the Stanthorpe district in large numbers during November occasioned a serious view of the position, there being a notable numerical increase of fruit fly and consequent damage to fruit in comparison with the four previous seasons. It was concluded that immigration was the main factor occasioning this outbreak of fly, as the majority of flies examined from the traps showed signs of age and travel, the wings in many instances being much chipped and worn, the colour of the flies dark, and the females contained ripe eggs in the ovaries. But in spite of the rather serious damage caused by fly to early stone fruit all through the district during November, 1930, the position steadily improved, the inconsiderable damage from this source during the remainder of the season being the most remarkable for many years. Late apples left on the trees during March and April remained free from fruit fly attack.

Seasonal Weather Conditions.

Weather conditions throughout the period embraced by the experiments were more than usually dry and hot, thus being unfavourable for fruit fly propagation. This was particularly so in season 1930-31, when the total rainfall from 1st November to the end of March was the lowest for many years, being only 1,012 points, and it cannot but be concluded that the dry conditions experienced operated to advantage by destroying countless numbers of fruit fly puparia in the soil.

Summary.

It will be realised that the period covered by the work undertaken was not ideal for obtaining conclusive results as to the importance or otherwise of luring as a control measure for fruit fly.

It has yet to be ascertained just how important luring is in a bad season when the fly is epidemic, but the trapping of large numbers of fruit flies, of which the majority are females, must in no small degree help in limiting local fruit fly increase, especially when it is realised that each female fly is capable of depositing about sixty or seventy eggs.

From the information set out in the accompanying tables it can at least be concluded that Jarvis lure is equally as attractive to both sexes of the Queensland fruit fly as any other lure on the market.

Most of the Stanthorpe orchardists, including the owners of the experimental orchards, now agree that this lure is in every way equally as efficient as any lure on the market. Being cheap, efficient, and easy of manufacture, it should meet the requirements of those interested in luring as one of the means of combating the fruit fly pest.

TABLE I.

Details of Fruit Fly Luring Experiments.

(The Counts in all Tables relate to the Queensland Fruit Fly, *Chaetodacus tryoni* Frogg.)

Month.	Total Number of Flies Caught.			Number of Male Flies Caught.			Number of Female Flies Caught.			Number of Female Flies with Eggs Caught.		
	Jarvis Lure.	Harvey Lure.	Total.	Jarvis Lure.	Harvey Lure.	Total.	Jarvis Lure.	Harvey Lure.	Total.	Jarvis Lure.	Harvey Lure.	Total.
Orchard No. 1 (1929–1930).												
1929.												
November	17	8	25	4	3	7	13	5	18	10	3	13
December	40	24	64	13	11	24	27	13	40	20	6	26
1930.												
January	33	21	54	7	9	16	26	12	38	26	4	30
February	42	31	73	12	8	20	30	23	53	14	4	18
March	39	14	53	2	6	8	37	8	45	31	7	38
Totals	171	98	269	38	37	75	133	61	194	101	24	125
Orchard No. 2 (1929–1930).												
1929.												
October	8	18	26	2	0	2	6	18	24	4	1	5
November	17	30	47	2	1	3	15	29	44	0	0	0
December	7	6	13	0	0	0	7	6	13	4	4	8
1930.												
January	33	29	62	3	11	14	30	18	48	12	4	16
February	202	222	424	7	23	30	195	199	394	124	156	280
March	20	16	36	7	5	12	13	11	24	10	8	18
Totals	287	321	608	21	40	61	266	281	547	154	173	327

TABLE I.—*continued.*

DETAILS OF FRUIT FLY LURING EXPERIMENTS—*continued.*

(The Counts in all Tables relate to the Queensland Fruit Fly, *Chaetodacus tryoni* Frogg.)—*continued.*

Month.	Total Number of Flies Caught.			Number of Male Flies Caught.			Number of Female Flies Caught.			Number of Female Flies with Eggs Caught.		
	Jarvis Lure.	Harvey Lure.	Total.	Jarvis Lure.	Harvey Lure.	Total.	Jarvis Lure.	Harvey Lure.	Total.	Jarvis Lure.	Harvey Lure.	Total.
ORCHARD NO. 1 (1930–1931).												
1930.												
October	13	11	24	2	2	4	11	9	20	9	9	18
November	96	76	172	10	19	29	86	57	143	75	41	116
December	88	30	118	18	8	26	70	22	92	66	20	86
1931.												
January	107	61	168	38	31	69	69	30	99	67	23	90
February	18	3	21	4	2	6	14	1	15	14	1	15
March	11	2	13	2	2	4	9	0	9	6	0	6
Totals	333	183	516	74	64	138	259	119	378	237	94	331
ORCHARD NO. 2 (1930–1931).												
1930.												
November	121	120	241	36	44	80	85	76	161	78	72	150
December	187	155	342	26	24	50	161	131	292	155	125	280
1931.												
January	80	56	136	38	35	73	42	21	63	26	16	42
February	13	20	33	3	11	14	10	9	19	8	8	16
March	14	29	43	3	9	12	11	20	31	11	20	31
April	3	3	6	1	0	1	2	3	5	2	3	5
Totals	418	383	801	107	123	230	311	260	571	280	244	524

TABLE II.

SUMMARY SHOWING TOTAL CATCH OF FLIES AND PERCENTAGES CAUGHT IN THE RESPECTIVE LURES.

Total Numbers of Flies Caught.	Males. Jarvis Lure.	Per Cent. of Total Flies Caught.	Harvey Lure.	Per Cent. of Total Flies Caught.	Total Males.	Per Cent. of Total Flies Caught.	Females. Jarvis Lure.	Per Cent. of Total Flies Caught.	Harvey Lure.	Per Cent. of Total Flies Caught.	Total Females.	Per Cent. of Total Flies Caught.	Females with Eggs. Jarvis Lure.	Per Cent. of Total Females.	Harvey Lure.	Per Cent. of Total Females.	Total Females with Eggs.	Per Cent. of Total Females.
ORCHARD NO. 1 (1929–1930).																		
269	38	14·1	37	13·7	75	27·8	133	49·5	61	22·7	194	72·2	101	52·0	24	12·4	125	64·4
ORCHARD NO. 2 (1929–1930).																		
608	21	3·4	40	6·6	61	10·0	266	43·8	281	46·2	547	90·0	154	28·2	173	31·6	327	59·8
ORCHARD NO. 1 (1930–1931).																		
516	74	14·3	64	12·4	138	26·7	259	50·2	119	23·1	378	73·3	237	62·7	94	24·9	331	87·6
ORCHARD NO. 2 (1930–1931).																		
801	107	13·4	123	15·3	230	28·7	311	38·8	260	32·5	571	71·3	280	49·0	244	42·7	524	91·7
GRAND TOTALS.																		
2,194	240	11·0	264	12·0	504	23·0	969	44·2	721	32·8	1,690	77·0	772	45·7	535	31·6	1,307	77·3

TABLE III.

DETAILS OF QUANTITIES AND COST OF LURES.

Season.	Orchard.	Lure Used.	Number of Gallons Used.	Cost per Gallon.	Cost per Orchard for each Lure.	Total Cost of each Lure.
				s. d.	£ s. d.	£ s. d.
1929-30	No. 1	Jarvis	6	2 9	1 7 6	2 8 1½
1930-31	No. 1	Jarvis	4			
1929-30	No. 2	Jarvis	4	2 9	1 0 7½	
1930-31	No. 2	Jarvis	3½			
1929-30	No. 1	Harvey	6	10 0	5 0 0	8 15 0
1930-31	No. 1	Harvey	4			
1929-30	No. 2	Harvey	4	10 0	3 15 0	
1930-31	No. 2	Harvey	3½			

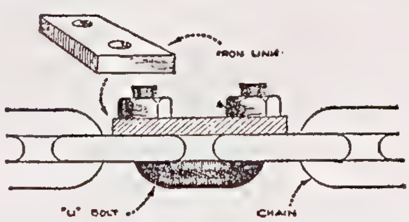
TABLE IV.

MONTHLY RAINFALL READING DURING THE PERIODS OF THE EXPERIMENTS.

1929-30 Season. Month.	Number of Days on which Rain Fell.	Total Rainfall.	1930-31 Season. Month.	Number of Days on which Rain Fell.	Total Rainfall.
1929.		Points.	1930.		Points.
November	8	265	November	9	149
December	9	336	December	7	179
1930.			1931.		
January	14	208	January	6	165
February	10	136	February	7	332
March	11	230	March	13	187
April	11	387			
Totals	63	1,562	Totals	42	1,012

CHAIN REPAIR.

According to the old saying, a chain is no stronger than its weakest link, and it sometimes happens that we find that particular link when we try to lift a load that is too heavy for the wagon lift at the elevator, or when we try to move a stone that is too heavy with the log chain hitched to the tractor. Chain is used in many ways on the farm, and when broken they can be repaired in a very satisfactory manner with the repair link illustrated here.



This repair link consists of two parts—a "U"-shaped bolt and a short piece of heavy strap iron. The "U"-shaped bolt is made of a piece of iron rod threaded on both ends. The threads must be cut before the rod is bent. The strap iron link has holes drilled in it at near each end. These holes are spaced the same as the spread of the bolt. The ends of the chain are united by the link as indicated. The diameter of the rod used in making the "U" bolt should be the same as the diameter of the material used in making links so that it will be of equal strength. The nuts are drawn down tight and the threads battered to keep them from working off.

CITRUS CULTURE.

By GEORGE WILLIAMS, Director of Fruit Culture, and R. L. PREST, Instructor in Fruit Culture.

THOUGH suitability of soil is one of the main considerations to be exercised when contemplating the establishment of a citrus orchard, markets and transport are of equal importance. In respect of markets the local season of crop maturity must be allowed for, and preference given to early, late, or midseason varieties as the demand warrants. In the most suitable coast lands growth is more vigorous than in inland districts, but, aided by irrigation in those where low rainfall is experienced, a firmer fruit of better appearance, texture, and quality is produced. Very much depends on a regular and moderate supply of moisture to develop the full flavour of the fruit, which is not attainable under an excess or fluctuating quantity. Before we can anticipate an appreciable export trade in oranges, production in districts beyond the range of influence of coastal atmosphere must be effected.

The soil conditions essential to satisfactory development of the trees, their cropping and longevity, are, briefly, good natural drainage, fertility, and friability. The land features should be as nearly level as possible, particularly where irrigation is to be applied. Drainage is indispensable —in its absence no other soil treatment can counteract the deficiency. Admitted that it can to some extent be provided adventitiously, but this cannot economically apply throughout an orchard, and will at the best not equal results where this essential is provided by nature. Fertility cannot be overlooked, though the physical condition of the soil may admit of deficiency within certain limits being remedied by judicious fertilizing. The maintenance of fertility is more readily effected in soils originally possessing the essential elements of plant foods. Land with very defined slopes is subject to erosion to a serious extent, particularly in districts experiencing very heavy rains. Provision may be made for the diversion of storm waters by furrows across slopes, but they are at the best unsatisfactory. There is ample land to select from, and that which requires a minimum of labour should receive preference.

In forest land the clearing of original timber, including stumps and roots to a depth of at least 12 inches, should be thorough—15 to 18 inches would be preferable so that subsoiling might be satisfactorily conducted throughout. It is much preferable to defer planting for a season than to attempt it where the land is unprepared. A light ploughing should follow upon clearing, leaving the ground in the rough to destroy such vegetation as may be included. Cross ploughing, cultivating, and harrowing for further reducing the soil to a fine tilth and collecting coarse weed growths and small roots are necessary. In most cases it is not desirable to bring the soil from a depth exceeding 10 inches to the surface, and where subsoiling is practised (though the deeper this is effected the better) the subsoil is merely disturbed or broken without any change in its position. The advantages of subsoiling are briefly that the effect of loosening the soil renders it more permeable to the roots, and the capacity for the retention of moisture during dry spells is much increased. Surface roots are undesirable, particularly in districts subject to a wide range of temperature. Where land clearing, including "running" roots, has not been effected to a sufficient depth to admit of the use of a subsoiling implement, explosives may be used, but trenching a field by this means at present rates will be found rather costly.

For explosives to be effective, the soil should be in a dry condition, and gelignite plugs (not less than $\frac{3}{4}$-inch diameter) inserted in the bottoms of holes of small diameter and of a depth of not less than 2 feet 6 inches to 3 feet would be preferable. Filling the hole, after inserting the charge, with dry sand will be all the tamping necessary. The lateral effect of the explosion is approximately 7 to 8 feet. The lighter the soil the less is the resistance and consequent reduction of shock.

Do not consider planting in forest lands until the necessary cultural operations have been completely and satisfactorily performed. Upon preliminary work much will in the future depend; consequently the occasion to be thorough cannot be too emphatically emphasised.

For laying out the orchard site a supply of short stakes is one of the first requirements. The distance apart and system of planting will determine the number for a given area. Planting is usually on the square system, and this is favoured in preference to what is generally known as the septuple (where each tree, excepting outer rows, is equidistant from its four nearest neighbours), practically planting in squares with a tree in the centre of each square. The septuple method admits of a larger number of trees per acre, but cannot be as economically worked nor offer equal facilities for interculture as square (or rectangular) planting.

For a 6-acre orchard an ordinary 66-feet tape will answer for laying out, but with larger areas, in addition to the tape, a marking wire is recommended. Ten-gauge galvanised steel is adapted for the purpose, having pieces of copper wire wound around it at the required distances apart, and soldered on to prevent their shifting; about $\frac{1}{2}$-inch width is sufficient to readily detect the spots. A 3-inch ring of $\frac{1}{2}$-inch round iron is securely fastened at each end, one of which is used as the distant end 3 or 4 feet beyond the last spot, the other at the exact space distance from the first spot on the wire. It is advisable to fasten these rings before attaching the copper spots. On the alignment being determined for one side this should be pegged at the required distances, and a rectangular line taken from each end to the corresponding corner of the opposite side, when this can be similarly pegged, utilising two crowbars, one being placed firmly in the position the one side peg previously occupied and one of the iron rings slipped over the top well down to the base. The wire is then unrolled across the field, and the other bar used (in the correct alignment) to pull the wire taut, and is driven into the ground to retain it so until the pegs are inserted—one at each spot. Practice demonstrates the advantage of leaving the ring at the straining end of the wire some distance beyond the correct place for the pegs which will be indicated by the copper wire spot. On ground of even feature 350 feet of wire can, by an overarm swing applied simultaneously at both ends, be readily moved from the site of one row to that of the next, and where the pegs are available three smart men will lay out 10 acres in one day.

The use of the planting board in ensuring the young tree being placed exactly in the site occupied by the peg has been frequently described in Departmental publications. For the reception of the trees, the surface soil should be taken out and placed on one side. Where explosives have not been used the subsoil should be broken up finely with a digging fork. There is no advantage in having the holes opened out in advance of the planting more than is necessary, as it only results in loss of moisture for no benefit. In planting, it is desirable that when

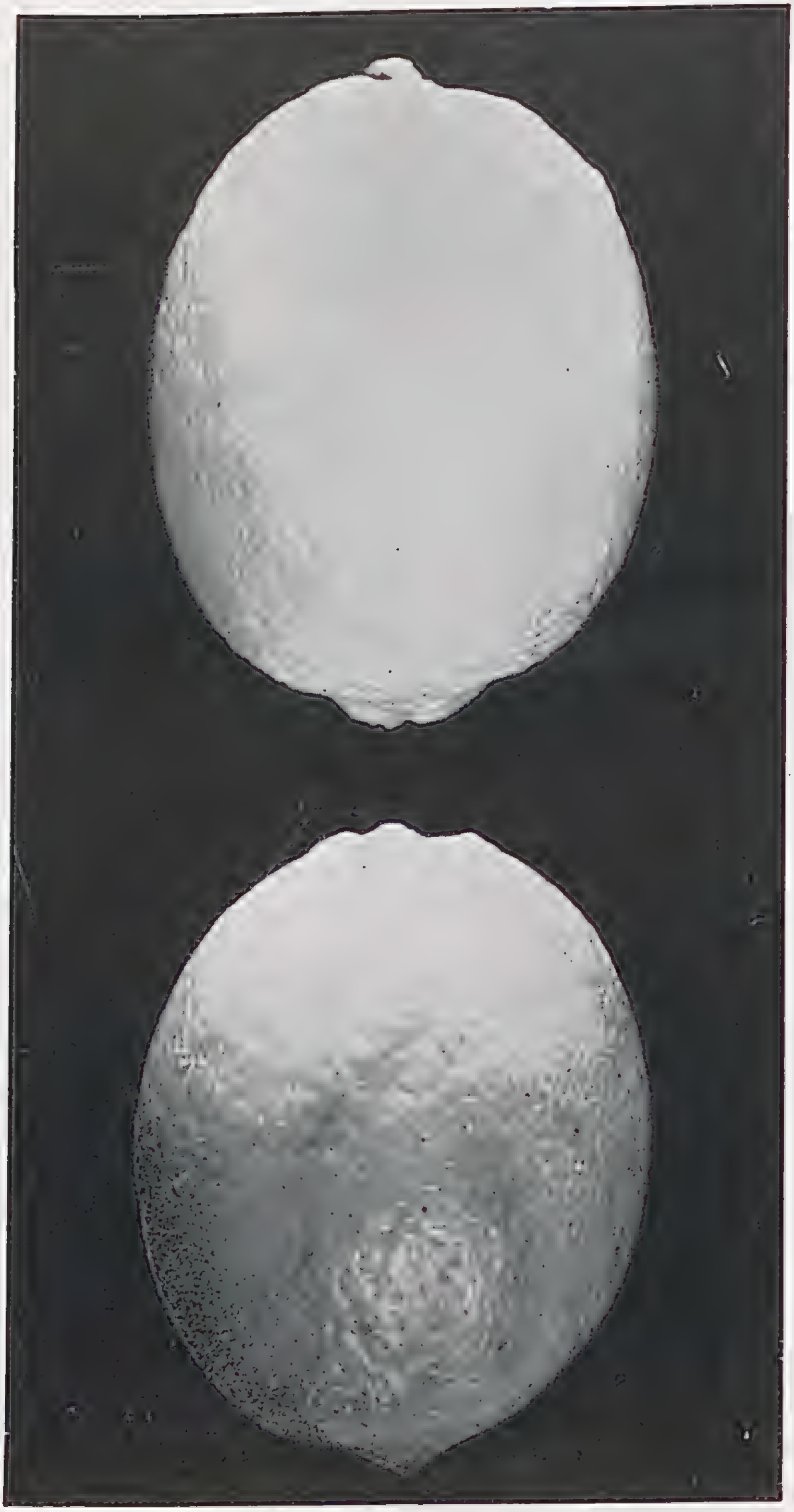


PLATE 126.—1. LISBON LEMON. 2. SICILIAN LEMON.

the soil has settled down the stock be not deeper than it had originally been grown in the nursery. It is preferable to err on the side of high planting. This is more material in the case of worked than seedling trees. In worked trees the junction of stock and scion should invariably be above the level of the surrounding soil surface. The roots should be spaced as evenly as possible and with a downward slope of 40 to 45 degrees, the spaces being filled with fine soil and pressed firmly, water being applied before the hole is completely refilled and allowed to soak into the soil before the refilling is completed.

The season of planting will be determined by location and local circumstances. Where low temperatures are experienced, July or early August planting is preferable to autumn, but where there is no danger of frost injury, autumn planting is satisfactory. It enables the trees to obtain a roothold, thereby materially assisting the early spring growth. In the warmer districts growth frequently continues right through the winter. Provided the young trees were sufficiently hardened in growth before being taken from the ground in the nursery (in the anxiety to get an early start planters are apt to urge nurserymen to forward before the requisite stage has been reached in autumn), and efficiently packed, they carry satisfactorily. As the methods of packing vary according to the time occupied in transit, it is often advisable to intimate when ordering the approximate time the package would be on the road. If the trees are lifted too early this will later be evidenced in the decay of the fibrous roots, a feature which will also be present if an excess of moisture is present in the packing material. Where the roots have been exposed to the drying influence of atmosphere, either in the nursery or after receipt, a similar result will ensue. Where the fibres are destroyed as a result of exposure, growth will be slow in starting, and the extremes of branches frequently die back. When attributable to excess of moisture or soft wood, the buds will frequently start in all parts, but those on the upper parts make but little headway, and become stunted or die back, and fresh growth originates near the base. Though the roots should be packed tightly and firmly for transport, the tops should not be tied tightly, and will better retain their condition if dry straw is interspersed amongst them. For autumn planting it is not advisable to defoliate the trees, but those which have been subjected to the hardening influence of cold weather will carry more satisfactorily if the whole of the foliage is removed. This, however, is not the general practice, and planters will find a more even start if they entirely defoliate spring-planted trees, and, at the same time, effect the necessary pruning or thinning of branches to ensure development on lines required. The most important item for attention in handling trees for planting is not to allow the roots to become dry under any circumstances, nor, to go to the other extreme, to allow them to remain immersed in water for more than two hours at any one time. When a large bundle is unpacked have trenches ready in which to place the plants close together, filling in the spaces with fine soil, and immediately water. For planting, take out a limited quantity at a time, and either keep their roots in water or rolled in damp straw in a wet bag, taking them out one at a time as planted.

Varieties.

Some twenty-two varieties of oranges, fifteen mandarins, six lemons, and an equal number of grape fruit are catalogued. An unwise selection frequently covering a wide range of varieties is mainly responsible for

Plate 127.—Lisbon Lemon Trees.

the number of unprofitable trees existing in the majority of orchards. The market requirements are reasonably met with a limited range, and this can be confined to trees of vigorous constitution and habit. There is nothing whatever to be gained, but much to be lost, by a wide assortment. The influences of different districts so affect some varieties that, whilst they may be very satisfactory in some, they are quite unsuited to others. Standard packs are being adopted for marketing citrus, and profitable marketing cannot well be conducted otherwise. To maintain such standards the least number of best varieties maturing over the season are indispensable; wide assortments merely defeat the object.

In oranges, Washington Navel, Joppa, Byfield Seedless, and Late Valencia are recommended. Some confliction exists between Jaffa (which is suitable only to specific districts and not characterised by high sugar content) and Joppa. The latter can be recommended for any part of the State. It is of good constitution, comparatively free from thorns, and a heavy and consistent bearer. Seeds are few, averaging about eight. Byfield Seedless has not been much in demand, although suitable to all citrus districts. The tree is very robust and thorny, and a good cropper. The texture and flavour of the fruit are good, and the entire absence of seeds is a special recommendation. Crops will hang until very late in the season, and the name "Seedless Valencia" has in places been applied to it on this account. Late Valencia is of wide distribution, and invariably satisfactory. An exceptionally vigorous sport, with rather larger fruit, which matures some weeks later than those of the parent; originated at Redlands. A very limited number of trees has been distributed, but larger quantities are now available and can be recommended. It is worthy of note that two of our best oranges, the Valencia sport and Byfield Seedless, originated in the State, and the highest quality mandarin, Beauty of Glen Retreat, is also of local origin. Other very promising mandarins have been brought under notice from Howard, Beaudesert, and Maroondan, but before these can receive endorsement for general planting it is desirable that they be tried in districts other than those of origin. The range of mandarins recommended has been limited to Beauty of Glen Retreat, Emperor, and Scarlet, with the addition of King of Siam in the northern parts of the State. Until something which is an improvement upon any of these—not only in respect of any special feature, but also in productivity and all-round market requirements—has been proved, it is not considered advisable to extend the list. Unfortunately, due care has not invariably been exercised in the selection of budwood for propagation, which is to some extent responsible for the presence of unproductive trees of standard varieties in very many citrus orchards. The principal nurseries have taken this matter up seriously, and much more reliable trees are now obtainable. To entirely eliminate this undesirable feature a citrus plot has been established by the Department in the Gayndah district, from which it is expected that sufficient budwood will be available as the trees (which have been propagated from selected wood taken from the best trees in the State) develop to meet the requirements of our propagators. In addition to oranges and mandarins, lemons and grape fruit have been included. Regarding the latter, more discrimination is being exercised in determining the genuine article. Several varieties have been introduced, and up to the present Marsh has been favoured, but is likely to be superseded by Duncan when the latter becomes better known. Other varieties are hardly worth considering. Regarding lemons, the

PLATE 128.—CLUSTER OF VALENCIA LATE ORANGES.

prospect of increased demand is not attractive. Lisbon, Genoa, and Villa Franca are unlikely to be superseded. Lemon culture on coastal lands is not recommended. The life of the tree is comparatively short, and the quality of the fruit at the best moderate and becoming inferior and gummy prior to the complete decay of the tree. The Tahiti Lime, which is sometimes referred to as a seedless lemon, is better adapted to coastal conditions and fulfils the requirements of the lemon, excepting in respect of the peel, which is valueless.

Other varieties of citrus which are grown to a limited extent and suitable for preserves are the citron, cumquat, poor man's and sour orange, pomelows, and sevilles. The latter are in limited demand for the manufacture of marmalade. Cumquats may be similarly used, but are preferable when preserved in syrup. Beyond small supplies for home use, there is no demand. Citrons are seldom successful and, being very subject to disease, can hardly be considered from a commercial aspect. Pomelows (or shaddocks) are not worth planting.

Stocks.

In nursery practice choice is confined to two kinds—seedling sweet orange and the Bergamot or common lemon. For mandarins, seedlings of the Scarlet type may well be considered. In deep soils, particularly basaltic and those of light texture, orange trees worked on to the sweet orange have given the best results. For heavier soils the lemon root will give at least equal return. One of the principal advantages of the orange stock is that the trees have much greater longevity—the growth in early years is slower but more lasting, and trees usually attain much larger dimensions. Trees on lemon are more vigorous in the first place, and will give a heavier return in the first few productive years. The common lemon is in general use as stock for grape fruit and lemons.

Selection.

In selection consideration must be given to market requirements, though it is usually advantageous to have the period of harvesting extended. Where early marketing is the most profitable, attention should be mainly confined to an early variety, and allowance made for assistance in harvesting. With mandarins consideration must be given to local influences. Some localities, particularly Howard and Byfield, are specially adapted for producing the Emperor, whilst Gayndah excels in Glen Retreat. Where any doubt exists in respect of suitability of varieties or other features, the intending planter should make inquiries from the Departmental district officer.

That preference be given by intending planters to trees grown in Queensland cannot be too strongly emphasised. Our nurseries are registered with the Department and their stocks are carefully inspected at regular intervals. Grade standards, which provide for normal development, are also applied to trees grown for sale. Unfortunately, serious disease not apparent at the time of planting has been introduced with trees from nurseries over which we have no control, and has created a very serious situation throughout the district in which they were planted.

Planting Distances.

Twenty to 25 feet apart, according to location, covers the average span allowed for development (where seedling trees are planted 25 feet should be allowed), 24 feet being considered a fair average. This allows

seventy-five trees per acre where planted on the square system. With mandarins 20 to 22 feet may be sufficient, but in small areas it is advisable for economic working that an equal distance be allowed throughout. Where the area exceeds 6 acres, separate blocks for oranges and mandarins would be allowed.

Training the Young Trees.

Pruning where necessary should be effected immediately prior to or soon after planting. In mandarins there is frequently an excess of branches. These should be removed to the extent that not more than four, to make the future main branches, remain. These should be spaced as evenly as possible, and if not robust, shortened by a-third or two-thirds of their length. Where the number of suitable branches for forming the tree are not present or are unfavourably placed, those which are misplaced should be entirely removed and others materially shortened to induce fresh growth. The removal of surplus shoots in their early stages should be followed in subsequent growths to prevent overcrowding, to direct the energies of the plant into permanent channels, and to avoid future amputations. As the young trees progress the occasion for frequent attention diminishes, but it is advisable at every cessation of growth to go over the trees and relieve any crowding or further development of branches which would ultimately result in that feature. Mandarins, particularly the Beauty of Glen Retreat, are prone to produce far more branches than desirable, and where these are allowed to remain a crowded tree of weak constitution and carrying dead wood in the centre will result. Remedying at later stages entails the amputation of large branches, which is undesirable.

Where any branch shows an excess of vigour and tendency to outgrow the remainder it should be stopped whilst in an early stage by pinching out the terminal. This is more effective than allowing it to continue until general pruning and then shortening. Where branches have a drooping habit they should be relieved of a part of their weight by shortening and the cut made to a bud pointing upwards. This feature is rather prevalent in navels and present to a less extent in Valencias.

General Pruning.

Provided the young trees have been reasonably tended subsequent pruning is simple and confined mainly to the removal of surplus small branches and shortening in older trees to induce new fruiting wood to supplant such as may have become crowded or weakened through over-production. Free admission of light and air are essential to the maintenance of healthy growth. See that due provision is made for this at the annual pruning, which, in bearing trees, is done immediately following the removal of the crop.

In removing young shoots the practice of breaking or rubbing them off may be expeditious, but is generally unsatisfactory, particularly on stems of young trees or at later stages on heavy branches. The shoot is temporarily removed, but generally adventitious buds followed by several shoots develop around its original base, and the effect of continuing to rub these off originates a callus, which must eventually be cut away. A clean knife cut in the first instance would have been followed by rapid healing and no further trouble.

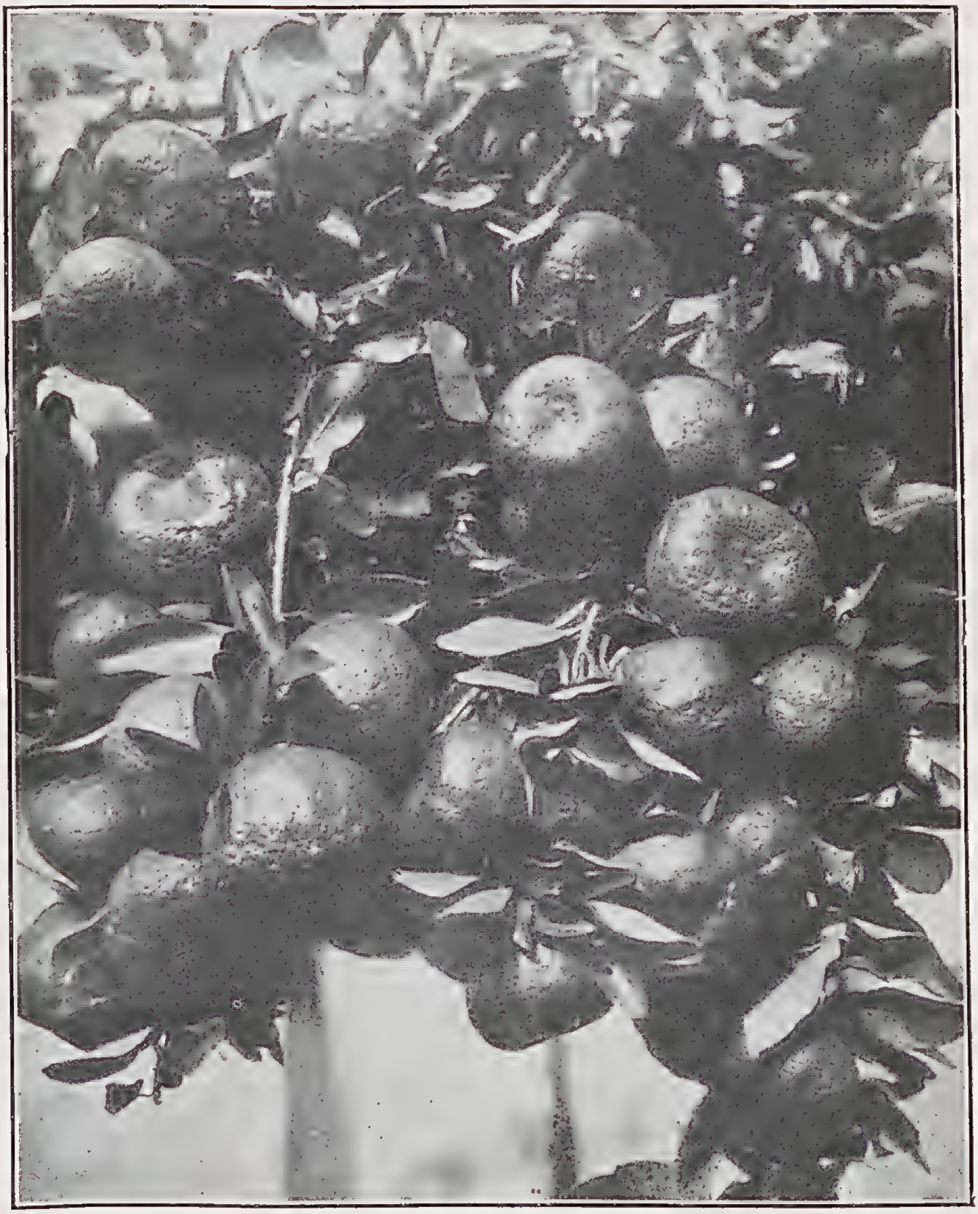


Plate 129.—Emperor Mandarins.

In pruning, all cuts should be clean and not left with jagged edges, and where the removal of a branch is necessary it should be effected by a cut as nearly corresponding with the direction of that from which it was removed and as closely to it as possible; no shoulders, snags, or projections of any kind should show on a pruned tree. In shortening branches, cuts should commence about the level or slightly below (dependent on the diameter of the branch) and opposite the bud which it is intended to develop and emerge slightly above it. A cut surface reasonably close to the bud will heal rapidly, and this also applies to branches cut close to the stem. It may not always be possible to remove surplus branches with the pruning saw, and a chisel and mallet should then be brought into requisition. In addition to these, a heavy ''Saynor'' pruning knife and secateur are requisite. All tools should be kept in the best possible condition—neat work is not performed with dull tools—and invariably oiled after use. The practice of painting wounds has many advocates, but its benefits are problematical. Saw cuts of any size should be smoothed, particularly around the edges, with a sharp chisel or knife. Lengthy experience and fairly extended observation have not noted a single instance of decay of wood or any damage whatever where cuts were correctly made and finished, in amputations up to several inches in diameter. After pruning or cutting trees affected with fungoid disease, tools should be dipped in formalin or carbolic acid to prevent subsequently infecting other trees upon which they may be used.

Pruning Lemons.

Lemons require slightly different training, and should from early stages be pruned to develop a fairly hollow centre and fewer large lateral branches. The finest fruit is produced on short spurs, from larger branches, and the formation of these is to be encouraged. The tree is often inclined to be more vigorous than productive, and this is rectified by topping the long branches about midsummer. Small branches may also be converted into fruiting spurs by cutting them back to within about 6 inches of their base during a growing period. The growth of the Tahiti lime being more of a drooping habit, thinning of branches is the principal attention required, and as development proceeds the removal of some of the lower branches is often desirable.

Fertilizing.

In reasonably fertile lands, the addition of fertilizer to the soil before or at the time of planting is unnecessary, but in land which has been previously cropped or that which would not be classed as fertile, assistance in this direction to the growing plants is required. Whatever fertilizer is applied, it should be incorporated with the soil, so that young roots in traversing the soil may come into contact with it but not brought into contact with existing roots at planting.

As the trees develop, the quantity of fertilizer required for each will correspondingly increase, and when fully developed an evenly continued regular supply is necessary. As crops are produced, so the natural fertility of the soil is being depleted, and where it has not been maintained by the application of such fertilizer as available, the effect is shown in impaired vigour of the tree and in the quantity and quality of its product. Where the lack of vigour mainly attributable to this cause is very pronounced (it may arise from other causes than absence of fertility or in combination therewith) drastic pruning is often

Plate 130.—A Well-grown Glen Retreat Mandarin.

necessary, even to the extent of heading back the main branches to within a few feet of their bases, to induce growth and practically to form a new head. A liberal application of fertilizer prior to the spring growth is also recommended. In volcanic soils, for a first dressing, an application of agricultural lime at the rate of 2 tons, Nauru phosphate at the rate of 10 cwt., sulphate ammonia 3 cwt., sulphate potash at 2 cwt. per acre has been found satisfactory, with subsequent half-yearly applications during July and midsummer. The maintenance of a supply of humus in the soil is absolutely indispensable.

The application of fertilizers twice a year is generally profitable, and improves both quality and quantity of the fruit. A mixed fertilizer, containing 2 lb. to 3 lb. sulphate of ammonia, 2 lb. to 6 lb. Nauru phosphate and superphosphate mixture (half of each), 1 lb. to 2 lb. sulphate of potash, applied at the rate of 4 to 16 lb. per tree, in accordance with its age, is recommended.

Interculture.

Ordinarily in Southern and Central Queensland, a citrus orchard is four to five years after planting before a return can be expected, consequently interculture is practised so that some return may be realised whilst the trees are developing. This, in some instances, is conducted to the extent of affecting their development, and has been particularly noted where pineapples are included. Pineapples, tomatoes, strawberries, and dwarf-growing vegetables (other than sweet potatoes), peanuts, &c., may be satisfactorily grown as inter-crops, but they should not be planted sufficiently close to the tree to impede its growth by encroaching upon its supplies of moisture and plant food; the actual distance will depend upon the variety grown, and to allow for the development of the trees the space allotted must be annually extended. Tall-growing crops should on no account be included in young orchards, and the extent of the ramification of the roots of those included must be considered.

Orchard cultivation in some phases has been a contentious subject, some growers averring that the introduction of the plough was detrimental, others consider it indispensable. The latter opinion is favoured and its adoption from the inception advised, though in average soils, for general working, the disc cultivator is considered more satisfactory. The effect of ploughing amongst trees, which had been permitted to develop without such attention, is that by severing the roots (which should not have been allowed to develop) trees are checked and growth and production suspended, and this can only be rectified within reasonable time by severely heading back their branches. The use of the plough or disc cultivator from early stages will not only prevent the development of surface roots but allow of a desirable mulch of loose soil being made available as required during the drier months of the year. The extent to which this can be availed of depends on local conditions, including the nature of the land and, if not practically level, the grade of fall. Sandy soils are more liable to "wash" than those of a loamy nature, but in either, where the fall is appreciable, heavy losses of surface soil is likely to occur in a very short time, consequently the provision of a loose mulch at the time of the year when heavy rainfall would be expected is considered inadvisable. It would be preferable, where soil wash was liable, to maintain a cover growth which later could be ploughed under to maintain the supply of humus. In all cases consideration of

PLATE 131.—A GOOD TYPE OF EMPEROR MANDARIN.

this feature is necessary, and particularly so in light soils. In volcanic soils shallow-rooting annual grasses offer a fair medium. In light land there is no occasion to select areas with defined slopes, and a cover crop of Mauritius bean, mat bean, or cow-peas (worked under in the green stage before maturing seed) is considered very beneficial in respect of providing nitrogen as well as humus. Fertilizing may be required to ensure a heavy cover crop, but as this is returned to the soil in the ploughed-in material, its utility is increased rather than diminished in the process. Frequency with which the land should be worked will vary according to circumstances, including rainfall, but when not under crop, to prevent wash or provide green manure, a fine tilth of a depth of 4 to 5 inches should be maintained. The maintenance of an even surface should be general and with no open furrows; where ploughing is practised, this must be rectified by throwing back a few furrows and harrowing level. Disc implements are recommended in preference to other makes, excepting where perennial weeds, instanced in couch grass, are to be eradicated, when other types of cultivators are more effective. Except for working in fertilizer, a disc cultivator meets all requirements and gives most satisfactory results. The spring tooth has its advocates, but has the disadvantages of rising over hard patches and throughout bringing the root ends where broken by its action towards the surface. The tendency of the disc is to cleanly cut the small surface roots and prevent their undesired formation.

Usually trees come into bearing the third or fourth year from planting. Some varieties are prone to over-production in earliest stages, and the young fruit should be thinned or entirely removed, otherwise the growth is likely to become impaired and result in a stunted tree. Under fair conditions at the fourth season from planting, trees should carry a few fruit, and at the fifth sufficient to pay for their cultivation. The grape fruit and lemon usually come into bearing earlier than other varieties. Though an even supply of moisture is desirable throughout the season to develop the fruit, excess does not benefit it. An excess of moisture results in rather insipid fruit, which is soft and much more susceptible to injury, also attack of various fruit rots that would not have developed in a drier atmosphere. In the drier districts rainfall is seldom sufficient to maintain the necessary soil moisture; and that citrus growing be a profitable proposition, irrigation is essential. Some of the finest lemons, mandarins, and oranges placed on local markets (not omitting the products of Southern Europe and U.S.A.) are produced in the Gayndah district, where the alluvial flats and the waters of the Burdekin River offer exceptional facilities for general citrus culture. Slight disadvantage of the distance in transport is far outweighed by the many advantages naturally provided.

Colouring.

No fruit should be gathered from the tree until it has reached a reasonable stage of development. Lemons should be gathered when their full size is attained, even though change in colour is not apparent, but in most districts reasonable colouring of orange and mandarin should be allowed, dependent to some extent on the variety, for it should be remembered that though the fruit may colour after being taken from the tree, there is no development of sugar content, and a sour orange when picked will continue to remain so. With grape fruit, full colouring should take place on the tree, otherwise the bitter flavour present in early stages will remain pronounced.

Plate 132.—Typical Productive Scarlet Mandarin Tree—Average Production 10 Bushels per Annum.

It must be obvious to all that well-coloured oranges and lemons will command a higher price on the market than those in a semi-green state. This would apply to a much greater extent on the Southern markets.

Queensland growers no doubt realise that their fruit is fit for domestic purposes many weeks prior to attaining the degree of colouring that the market desires. Citriculturists who have had experience in various citrus-growing localities will agree that oranges growing in the cooler regions have ample colour long before they attain sufficient sugar to make them desirable for eating purposes, while those produced in warmer climates are sweet and luscious for some time prior to taking on the deep orange appearance which commands the higher price on the market. There is ample room in the Southern States for the production of fruit for the late market, and as the producing cost is somewhat less in those districts, the Queensland grower would be well advised to devote his attention chiefly to the supply of early fruit, and consequently he would reap the advantages of the high prices prevailing in the early part of the season.

COLOURING CITRUS FRUITS.

By R. L. PREST (Instructor, Fruit Culture).

For colouring citrus fruits ethylene gas has superseded carbon dioxide. The method of treatment with ethylene gas is as follows:—The fruit on reaching their full size develop a number of minute yellow or orange-red coloured bodies in the outer cells of the rind. At first these are overshadowed by the green of the chlorophyll present, but as the ripening proceeds the skin loses its green colour and the yellow or orange pigments in the rind show up. Under natural conditions these changes are affected by climatic conditions. Excessive moisture retards the colouring process, which is particularly noticeable in Valencia lates. Even when coloured rain or over-irrigation tends to turn them green again. Cold weather apparently hastens the colouring process.

As citrus fruits are only sold to their best advantage when mature, full flavoured, and showing an unblemished skin with its normal ripe colour, any assistance in colouring such fruit as lack their normal colour but possess the former qualities will enhance the market value. In some districts such varieties as the Navel and Joppa oranges and Emperor mandarin have the desired qualities but lack the normal ripe colour. Lemons, when of a desirable size and mature, should be picked when dark green in colour. Light green lemons may be of equally good quality, but do not possess the carrying quality, whilst tree ripened or coloured lemons are usually thick-skinned, with a poor juice content.

The colouring or forced curing, a practice known in California as sweating, was formerly done by gaseous products generated from kerosene stoves. In 1924 Denny found that ethylene gas in small quantities was capable of producing the same results. He found, howver, that a very high percentage of gas (80 per cent., for example) delayed colouring. Colouring was also delayed by as high a temperature as 92 deg. Fahr. and by as low a temperature as 45 deg. Fahr. A temperature of between 60 and 70 deg. Fahr., with a humidity of about 70 per cent., was considered satisfactory.

Any ordinary room lined with timber, gas-tight, and having adequate means for ventilation, may be used. It should have an inspection port

fitted in the door or a suitable wall so that a thermometer reading can easily be taken without opening up the chamber. An ideal room would be one that is lined inside and outside and insulated with sawdust.

Ethylene gas can be obtained in a metal cylinder at a high pressure. A regulator valve is connected to the cylinder. The gas passes into the regulator valve, where it is held until release. It then passes through tubing attached to the regulator valve into the room. The quantity of gas passing into the room is recorded by the regulator valve, so that the correct charges, according to the size of the chamber, may be given.

Fruit to be gassed should be loosely packed in open cases, having plenty of ventilation. Dunnage should be used in stacking in order to have an air space round each case. The chamber should then be closed, making sure that it is airtight. Insert the tubing through a suitable hole made for the purpose and give the required charge. Remove the tubing and plug the hole. Allow the room to remain closed for at least four hours, when it may be opened up and ventilated in such a manner as to replenish it with fresh oxygen. After a thorough ventilation the room may be recharged at once, but it is advantageous to allow it to stand without gas for at least two hours.

About 1 to 1½ lb. pressure per 1,000 cubic feet of room space is the maximum required in an airtight room for successful colouring. Other conditions favourable, it seems to take a very slight amount of gas.

The following points should be observed when colouring mature lemons, oranges, and mandarins:—

Lemons.

Room temperature, 60 to 70 deg. Fahr. Applications, two per day. More may be given if desired. Time, from three to five days. The colouring process will continue after the fruit is removed from the room, providing the process has been properly applied.

Oranges and Mandarins.

Room temperature, 70 to 80 deg. Fahr. Three applications per day are generally considered sufficient over a period of three to four days. When the temperature is high the humidity should be kept up. The reading of the wet bulb should not be more than 10 degrees below the reading of the dry bulb.

Humidity can be increased by placing wet bags or an open vessel containing water in the room, and decreased by placing sand, quicklime, or caustic soda in the room, moisture being thus absorbed.

The sweating of citrus fruits only assists in the colouring process, and has no effect on the maturing or sugar contents. Growers must, therefore, exercise great care when picking.

The subject of careful handling of all fruit has been so frequently stressed that further details seem superfluous. The chief points to be remembered are that the fruit be cut from the tree as close to its base as can conveniently be managed (an orange clipper specially made for the purpose is available at a nominal cost) ; that it be treated as fragile in the first and all subsequent handlings, carefully stored and graded before packing. Various makes of graders are obtainable, and selection can be made according to the output of the orchard. Wrapping first-class fruit enhances its value, besides providing other advantages. Fruit

should be gathered under driest possible atmospheric conditions. It should be retained at least seven days before casing, and carefully examined at packing so that no specimens containing fruit fly are included.

Standard bushel cases are prescribed market containers and, though the original flat packer with its central division has many advocates, the adoption by Victoria of the 18 by $7\frac{1}{8}$ by $8\frac{2}{3}$ half-bushel case for citrus tends to put this type of case practically out of use; the tendency is not deprecated. For the softer mandarins, in the production of which Queensland by far excels the other States, also in regard to quality, the dump bushel is not considered the most suitable, but the half-bushel meets their requirements admirably. It should be recognised that the general "get-up" of the fruit for market is almost as important as quality. The sale of otherwise excellent fruit of good appearance is too frequently handicapped by indifferent grading or packing, also the inclusion of odd blemished fruit and the use of second-hand cases for local market has a more baneful influence upon sales than is recognised. Cases should contain one variety, and be legibly marked with the name of such, graded according to size and blemishes. Blemished fruit should not be included amongst that which is entirely free from external markings of the skin. Blemishes may arise from various causes—limb rub, fungi, including scab, black brand and melanose (the latter being the most general), and insect injury, including the discoloration due to Maori. The practical elimination of blemished fruit can only be effected by maintaining the trees in a healthy condition, and the greatest concern is how this can be effected at a minimum of expense and labour. Despite all care and attention that may be bestowed upon the orchards, "disease" sooner or later will make its appearance, and a keen faculty of observation should be applied so that its presence may be noted in the earliest stages. Very much influence against disease is exercised by the application of the necessary cultivation and fertilizing, and though pruning may sometimes be referred to as superfluous, its advantages are manifold. Trees should be maintained in the best possible condition that they may ward off attack or be less influenced thereby.

Lemon Curing.

Lemons carefully handled and gathered from the tree at the right stage of maturity may be successfully cured and stored on the orchard for several months without deteriorating, but rather with improvement to their appearance and keeping and edible qualities.

The fruit should be clipped (not pulled) from the trees, with not more than one-eighth of an inch of the stalk remaining, just as it is commencing to show colour, and in order to avoid injuring or bruising and thereby leaving the fruit open to the attack of moulds, it is important to remember that it must at all times be handled with the very greatest of care. When gathering the fruit from the trees, pickers should wear a basket or box slung in front of them by a strap round the neck, with another round the waist to steady it. The handiest size for this receptacle is about one-third the capacity of a kerosene box. Careful growers will pad the inside with some suitable material as an extra precaution. After picking, the fruit should be placed in a shed or other shaded place and allowed to remain for several days to "sweat" off excess moisture from the rind. During this time, unless conditions are very dry, beads of moisture will appear on the surface of the lemons, and before they

are placed in the storing material they must be thoroughly dried with a cloth. If the lemons are not sweated they will tend to become unnecessarily damp in storage and more liable to infection by moulds.

There are several materials which may be used for storing the fruit, the best of which are sand, sawdust, and chaff, though, in the case of the latter, the fruit should be first wrapped in tissue paper. They may be either stored in boxes or in layers on the dry floor of a shed. A layer of whatever material is to be used is first laid down about 2 inches deep, and a single layer of lemons placed on this so that no two fruits are touching. The layer of lemons is then covered with an inch or so of the storing material, and then another layer of fruit, and so on until there are several layers of fruit. Where the fruit is stored in boxes it is advisable to first line the boxes with paper. The fruit should be inspected periodically, and all which show signs of decay removed and burnt.

During curing the colour of the fruit changes from green to yellow and becomes smoother and thinner in the rind. The texture of the fruit also is improved, and a larger percentage by weight can be expressed as juice than from uncured lemons.

Pests and diseases are dealt with in special publications issued by the Entomological Branch. The cost of spraying materials is becoming a decided oppression, and under existing conditions there appears little prospect of alleviation. Though the efficacy of standard brands of spraying oils, plain and emulsified, is not questioned, the advance in prices is sufficient to warrant investigation and experiments for a suitable substitute. It would be superfluous to enter into details regarding the benefit derived from the proper application of insecticides and fungicides. Prior to the advent of the miscible oils now in general use, kerosene emulsion and various formulæ in which resin was the principal or the only destructive agent were used. A serious disability in connection with kerosene emulsion was the tendency, by running down the main stems, to impregnate the soil, to a depth up to 12 inches in the immediate vicinity of the tap root, sufficiently to completely destroy the bark and consequently the tree—the injury not showing above ground until the damage was complete. The effect was much more pronounced in soils which, under dry conditions, had a tendency to slightly contract from the tree, though equal injury has been noted in fine light soils. Bandaging the trunks with absorbent material to absorb the excess of emulsion in its descent was not efficacious, but, where the soil was fine and dry, heaping it around the main stem so that the liquid was distributed over a wider area and away from the tree base materially prevented injury. The covered portion of the stem would be sprayed lightly after the soil had been removed.

Resin wash formulæ, containing a varied proportion of resin, from 1 lb. to 3 gallons of water to 1 lb. to 8 gallons, caustic soda being used in dissolving the resin, and a small quantity of fish oil included, were mainly used before the advent of miscible oils. The concentrated solution entails constant attention whilst being boiled, and in application resin washes are at least unpleasant. Unless the solution is applied hot the pump valves are apt to stick and the distribution is poor. The action of resin wash is that by covering the insect both air and moisture are excluded and the pest smothered. The effect upon citrus trees of continued spraying with resin was found to be detrimental, for in addition to smothering the insect, the foliage was for some time subsequent to the operation subjected to the same influence. If the weight

of costs compels reversion to early methods, kerosene emulsion with the addition of a small quantity of resin (1 lb. to each gallon of kerosene) is recommended. This necessitates the use of soft soap, also boiling. One quart of soft soap and 1 lb. of finely powdered resin boiled in 2 quarts of water (or in larger quantities of these proportions) should be slowly boiled until the resin is dissolved (about forty-five minutes). After removing from the tin, up to 2 quarts of kerosene should be added whilst the mixture is still boiling hot and agitated with a pump for a few minutes, when the emulsion will be complete. The emulsifying process is much improved if a little ammonia is added with the kerosene. For application this is diluted so that approximately one-sixteenth of the liquid is kerosene, the amount varying under different circumstances. Few of the formulæ now recommended for the destruction of pests will fail to be effective, even if they are slightly modified. The particular points, which cannot be too strongly emphasised, are:—Be on time; make the application at a time calculated to give best results; the destruction of one insect may mean the destruction of hundreds, and one application at the right time frequently means protection against innumerable spores of fungi which are endeavouring to gain a foothold; be thorough; when spraying a tree spray it well; the operator will be regarded only to the extent which he has been painstaking; apply sprays intelligently—this is the most important factor in the work.

The line of treatment against fungi is to cover the stem, foliage, and fruit with some substance which will destroy the spores which may be present as soon as they germinate, or have the power of preventing this germination. That the applications be thorough and economically and evenly applied a good outfit is indispensable. In established orchards of large trees a power sprayer is a necessity. It is most useful amongst younger trees, but the cost may not be available, when barrel pumps are relied upon. Good results will attend the expenditure of labour in maintaining a good pressure, without which the results cannot be satisfactory.

Fumigation.

The cost of suitable sheets for covering trees for fumigating with cyanogas (which has supplanted soda cyanide) is excessive, particularly in view of the condition of cotton markets. A complete outfit is beyond the means of the average orchardist to purchase; but when the present cost of spraying material, including pumps, general efficacy, and effect upon the trees are considered, fumigation will show the most favourable aspect. There is no apparent reason why each association or combination of growers in any productive locality should not procure an outfit of sheets of dimensions sufficient to meet local requirements, and this feature is again commended for consideration. Trees which have been sprayed with Bordeaux mixture should not be fumigated until at least three months have elapsed. Where lime sulphur spray has been applied it should not be followed by oil sprays for a minimum of six weeks.

The cost of establishing a citrus orchard varies according to location and local circumstances. If fertile scrub lands, where stumps are not removed, the expense of preliminary work would be much less than in forest land. Apart from the cost of land, fencing, and building, the expense in forest land is estimated at—

Clearing and running roots to a depth of 16 inches, £14 to £26 per acre.
Ploughing, subsoiling (to 15 inches), and cultivating, £7 10s. per acre.
Trees (75) and planting £8 per acre.

1. An Unproductive Scarlet Mandarin Tree.

2. The same Tree Headed Back for Working Over after New Growth Develops. (Note Young Shoots Starting.)

Plate 133.

Roughly an average of £36 per acre, to which must be added, for subsequent cultivation and attention, the necessary implements and horse (or horses), spray pumps, and tools. The cost of maintenance will depend upon the system adopted—whether the interspaces are utilised for growing small crops, and the nature of such crops, or clean cultivation is maintained throughout.

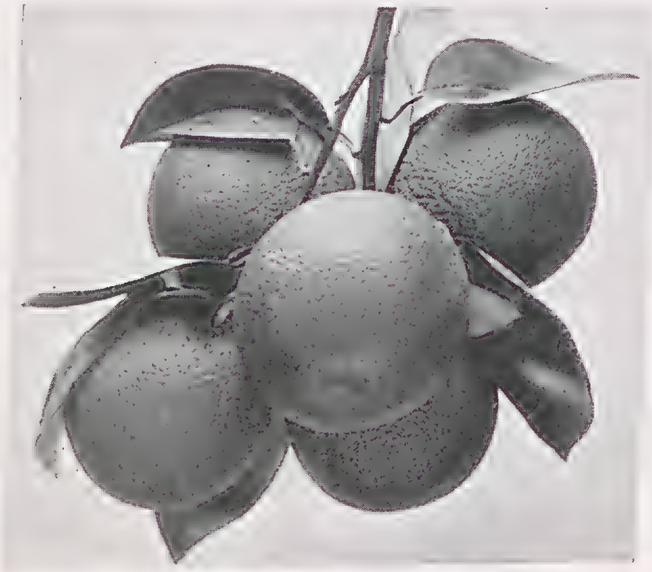


PLATE 134.—BYFIELD SEEDLESS ORANGES.

Working Over Trees.

The method adopted in working over grown trees which have proved unprofitable is to remove the head of the tree during the winter when the tree is dormant by cutting back all branches to within 2 to 5 feet of the trunk, according to the size of the tree, and leaving only a sufficient number to form a new head.

During the spring numerous shoots will start from the branches remaining, and these may be thinned out after the first growth has hardened to three or four suitably placed near the end of the shortened branch. Later these can be reduced to two. When the shoots are about 6 inches long the terminal growths should be nipped out to lessen their chances of being blown off by the wind, and also to "stiffen" the growth. During the following autumn the trees will be ready for budding, which is done on the young shoots, or they may be left until the next spring. Trees worked over in this manner will carry a crop of fruit two years after working, and will rapidly attain the same dimensions as the original tree.

In some publications it is recommended that in heading back trees at least two branches be allowed to remain to act as draw branches to maintain the vitality of the tree. This may be necessary if heading back is done at a period when the tree is in growth or, in other words, at the wrong time of the year; but when the heading back is done during the winter, when the growth has terminated, the whole of the top may be safely removed without fear of the tree dying back; in fact, better results can be obtained when no "draw branches" are left and the future shape of the tree can be more readily formulated.

CLIMATOLOGICAL TABLE—SEPTEMBER, 1931.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·01	84	72	86	15, 18, 19, 28, 29, 30	62	3	31	3
Herberton	..	79	56	87	3	48	2, 3	26	4
Rockhampton	30·08	82	61	91	15	55	5, 18	275	5
Brisbane	30·09	76	56	86	14	45	1	90	7
Darling Downs.									
Dalby	30·06	77	49	91	15	35	1	147	7
Stanthorpe	..	68	42	80	25	27	1, 3	234	9
Toowoomba	..	71	47	85	15	33	1	137	8
Mid-Interior.									
Georgetown	29·98	91	64	98	10	46	5	471	2
Longreach	30·01	86	56	99	15	43	4, 5	108	3
Mitchell	30·04	80	48	92	15	35	5	23	3
Western.									
Burketown	29·98	90	66	97	28	56	5	0	..
Boulia	30·00	87	56	98	14,25,29	49	1	65	4
Thargomindah	30·02	78	50	95	25	37	9	27	3

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1931 AND 1930 FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.,	No. of Years' Records.	Sept., 1931.	Sept., 1930.		Sept.,	No. of Years' Records.	Sept., 1931.	Sept., 1930.
North Coast. ..	In.		In.	In.	*South Coast—continued:*	In.		In.	In.
Atherton	0·66	30	0·31	0·71	Kilkivan	1·70	52	1·57	0·85
Cairns	1·69	49	0·72	1·21	Maryborough ..	1·92	59	0·75	0·98
Cardwell	1·53	59	0·65	0·46	Nambour ..	2·53	35	2·03	1·26
Cooktown	0·59	55	0·31	0·45	Nanango	1·79	49	2·67	1·16
Herberton	0·49	44	0·26	0·36	Rockhampton ..	1·31	44	2·75	0·24
Ingham	1·50	39	1·18	0·80	Woodford	2·18	44	1·81	1·52
Innisfail	3·55	50	2·02	1·24					
Mossman Mill ..	1·44	18	1·22	0·48					
Townsville	0·83	60	0·32	0	*Darling Downs.*				
Central Coast.					Dalby	1·68	61	1·47	0·92
					Emu Vale	1·74	35	1·10	1·54
Ayr	1·45	44	0·27	0	Jimbour	1·49	43	1·60	0·78
Bowen	0·83	60	0·28	0	Miles	1·36	46	0·53	0·78
Charters Towers ..	0·75	49	4·13	0·21	Stanthorpe ..	2·28	58	2·34	1·02
Mackay	1·59	60	0·97	0·07	Toowoomba ..	2·14	59	1·37	1·47
Proserpine	2·17	28	0·08	1·81	Warwick	1·80	66	1·79	1·33
St. Lawrence ..	1·25	60	5·05	0					
					Maranoa.				
South Coast.					Roma	1·44	57	0·32	0·06
Biggenden ..	1·54	32	1·35	1·45					
Bundaberg	1·64	48	0·83	1·54					
Brisbane	1·99	80	0·90	0·95	*State Farms, &c.*				
Caboolture	1·85	44	1·49	0·73					
Childers	1·80	36	2·15	1·64	Bungeworgorai ..	0·97	17	0·18	0·13
Crohamhurst ..	2·59	38	1·81	0·21	Gatton College ..	1·56	36	0·83	1·15
Esk	2·15	44	1·10	1·58	Gindie	1·04	32	1·17	1·01
Gayndah	1·57	60	1·16	2·40	Hermitage ..	1·48	25	1·32	1·28
Gympie	2·11	61	1·10	2·00	Kairi	0·65	17	..	0·52
					Mackay Sugar Experiment Station	1·49	34	0·31	0·18

J. H. HARTSHORN, Acting Divisional Meteorologist.

The Young Farmer.

LESSONS IN PIG RAISING.—II.

(Prepared by Officers of the Department of Agriculture and Stock.)

SELECTION OF THE PIG.

In selecting the pig the requirements of both the consumer and the grower must be considered. The market requires pigs of certain definite weights, and with long, smooth bodies, well developed and rounded in the hindquarters, comparatively long in the sides, and light and fine in the shoulders, neck, and head. The legs should be moderately long and fine, denoting fine quality, light bone throughout the carcass. The skin and hair should be fine and smooth, showing quality. Pigs, when marketed, should be in hard, fleshy condition, and not excessively fat.

The pig-raiser wants the pig which will grow rapidly on little food, resisting disease and parasitic infestation, and which, if retained for breeding purposes, will be capable of producing large numbers of good young pigs. This class of pig should come from a large litter, and be the progeny of a large boar and sow which show plenty of quality and character. The pig, when weaned, should be well grown in comparison with its litter mates; it should be vigorous and rather lengthy in type; a young pig which has short legs and a short, thick-set body, with heavy shoulders, does not grow into the best class of animal. It is preferable to select the lengthy pig, as it should develop into a long, lean, and fast-growing porker or baconer.

There should be more certainty of getting a good pig from pedigree stock bred true to type and improved for many generations than from inferior or mongrel breeding stock.

Questions.

(1) When selecting a pig, what requirements must be considered?
(2) Describe the type of pig the bacon trade requires.

DAIRY FLOORS.

A report was received just lately from a dairy farmer that he had met with failure in attempting to grout between the bricks on the floor of the milking-shed. He tried three different brands of cement, using mixtures of 4 to 1 with toppings, 3 to 1 with sand, 3 to 1 with stonedust, and he even used neat cement, all with the same result—the mixture failed to harden; in fact it was like mud. A member of the technical staff of the association was sent out to investigate and give the farmer some helpful advice. The first thing he discovered was that the bricks themselves were the seat of the trouble. They were hand-made bricks, obtained about forty years ago. Several of the bricks were taken up and cracked open. There was a strong, stale smell of decomposed organic matter, which had soaked into the bricks with the continued washing down and sweeping twice daily after milking. The decomposed organic matter had such strong effect on the cement that the usual setting properties were altogether destroyed.

This was the way in which the job was fixed up: First, the whole floor was swept clean, using plenty of fresh water. Then the bricks were chipped all over with an ordinary pick and light crowbar, so that the surface was made rough and as many corners knocked off as possible. Next the floor was washed over, using a strong solution of caustic soda, followed by plenty of water to remove all traces of the caustic soda. Then a mixture was made up of two parts of clean sand to one part of cement, and applied as a thin grout over the whole floor, using a stiff yard broom. It was allowed to dry out for one day. The effect of the decomposed matter in the porous bricks was still noticeable. It affected this thin wash to some extent, yet at the same time a protective coat was obtained. Over this coating a layer of concrete, 3 in. thick, was spread. The mixture consisted of one part of cement, two and a-half parts of clean, washed sand, and four parts of bluemetal screenings. The surface of the concrete was not trowelled; it was merely ruled off with a straight piece of wood, leaving a coarse, rough surface, upon which the cows will never be likely to slip. At the same time, the milking-shed now has one of the best floors in the district. As soon as it is washed over after milking it is perfectly clean. Concrete is not porous; it does not soak up any of the organic matter, and the old stale smell has gone for ever.

Answers to Correspondents.

Fungus.

S.E.S. (Summerhill, Beaudesert Line)—

Mr. R. B. Morwood, Assistant Pathologist, advises that the fungus is a species of Clathrus, one of the Phalloids or Stinkhorn fungi. Owing to its objectionable smell it is inedible, but it is not recorded as being poisonous. The objectionable smell previously referred to originates from the decomposition of certain issues of the fungus. It would probably be as dangerous to consume this as it would be to eat decomposed meat, &c. Domestic animals which avoid carrion would presumably also avoid the Stinkhorn fungi.

The following information is supplied in answer to a number of inquiries:—

White Hide—Tanning Process on the Farm.

As it is almost impossible to enumerate the uses to which good white hide may be put, especially on a farm, the necessity for careful selection of the hide to be treated cannot be too greatly stressed.

The ideal hide for general purposes such as harness repairs, leg ropes, cart and sulky reins, bridles, bullock whips and falls, straps of all sizes, &c., is that of a fat, four-year-old, whole colour steer or heifer, the latter being slightly finer.

If a thinner and much finer quality hide is required, a four to six year old whole colour Jersey female in good condition will produce it. Hides to be carefully avoided for farm tanning are those of spotted or low-conditioned animals, of whatever breed or age. In the former case it has been conclusively proved that, wherever there is a white patch the hide is thinner, and good work cannot be done with a hide of varying thickness; in the case of poor animals the hide is practically useless. Before killing have ready a well-scoured cask (a 40-gallon one will hold any hide), put in about 16 gallons of water and a good half-bucket of slaked lime. This is to loosen the hair and neutralise the fat. Bleed the animal, first from the heart, then sever both artery and jugular vein in the neck. Have the head slightly down hill if possible when sticking. Skin the animal carefully, as a bad score or cut may spoil an otherwise good strip of leather. While warm skin off as much waste fat and flesh as possible. Trim off scraggy leg and belly points, and lay the hide out flat on a clean floor in the shade and allow it to become cold.

Then stir the water and lime in the barrel and lower the hide slowly into the liquid to prevent the formation of air pockets, poke down and stir again. Weigh down with wood any part that comes to the surface. Do this once a day, or more frequently until the hair begins to come off. Throw the hide over a barrel on a flat surface and scrape both sides clean with skinning and/or fleshing knife. Be careful not to mark the hair side of the hide with the knife. If all the hair does not come off at first, put back for a day or two. Empty and sluice the cask; about half fill it with clean water and leave the hide in it while preparing the curing solution. Dissolve 8 lb. of salt, common or coarse, in half a kerosene tin of boiling water; leave to cool. Dissolve 4 lb. of powdered alum in half a kerosene tin of boiling water and leave to cool. Mix 8 lb. of white flour into a thin paste, free of lumps. The best way to do this is to put about 2 lb. of flour into a kerosene tin and mix into a stiff paste with cold water, add a little more water; stir briskly with either the hands or a stick. Repeat this until the tin is about half full. The hide can now be thrown over a fence or the like to drain. Empty the cask and put the flour paste in. Mix more flour as before up to 8 lb. and add to that in the cask. When the alum and salt solutions are cool, add the flour paste and mix thoroughly. Allow to stand over about fifteen minutes and mix again. Lower the hide as before and add just sufficient clean cold water to cover. Poke down with a heavy stick until you are sure that all air is out and weight with wood any portion that comes to the surface. Leave for two days. Stir at least once a day for three weeks. Take care each time to stir right down from the bottom, get all the air out and weight it down as before. Do not allow iron to come into contact with the hide when in the solution, as it will leave an indelible rust patch.

When the time is up, hang the hide in the shade, throw a few buckets of water over each side and leave for about half a day, reversing it occasionally. Spread on a flat surface, and rub in with smooth-ended piece of wood equal parts of common tallow and neatsfoot oil on one side only, using plenty. Leave for a few hours if convenient, then roll up as tightly as possible. Wrap up in bags and leave for a few days when it will be ready for use.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Wart or Bitter Cress.

T.A.N. (Gympie)—

The specimen is the Wart Cress or Bitter Cress, *Senebiera didyma,* a common European weed naturalised in most warm temperate countries. It is quite common in Australia as a weed, particularly during the early spring months. It taints milk very badly, but is, however, rarely seen in pastures, being essentially a weed of cultivation.

Bindweed.

F.O.B. (Gatton)—

The specimen is *Convolvulus arvensis,* the common Bindweed, a native of Europe, now naturalised as a weed in most temperate countries. In Queensland up to the present instance it was, so far as we know, confined to a few isolated patches on the Darling Downs. It is one of the worst weed pests so far introduced into Queensland, and should be eradicated as far as possible on its first appearance. It produces a large number of underground running roots, almost any small part of which, when cut, is capable of forming a new plant.

Tea. Fennel Flower. Asafoetifa. Barberry.

W.E. (Beaudesert)—

1. The Tea plant, *Thea sinensis,* is grown as an ornamental shrub in a few places. If you wrote to Mr. G. Rankin, Bonnie Brae, Beechmont, he would probably give you seeds, as he has some shrubs in his garden which set seed quite freely. We do not, however, know of the particular variety he has nor anything of its value for ordinary tea.
2. Paraguay Tea, *Ilex paraguayensis.* The true Paraguay Tea is not growing anywhere in Queensland so far as we know. Some trees labelled Paraguay Tea in the Brisbane Botanic Gardens and other public parks proved on examination to be something totally different. The Department of Agriculture has imported seeds from South America at odd times during the past few years, but the seeds so far have always failed to germinate.
3. Fennel Flower. *Nigella* is commonly known as Fennel Flower, but the common Fennel, of which the young leaves are used for flavouring the seeds for the expression of an aromatic oil is *Fœniculum officinale,* which is quite commonly naturalised as a weed on the Darling Downs between Toowoomba and Warwick. It sets fruit about February or March.
4. Asafœtifa is not obtainable in Queensland. You might be able to get seeds from the Botanic Gardens, Melbourne, but of this we cannot be sure.
5. Barberry, *Berberis vulgaris.* This is occasionally seen as an ornamental shrub in gardens on the Darling Downs at Toowoomba and Warwick. We do not know where you could obtain seeds in Queensland. The Botanic Gardens, Melbourne, might be able to supply you with some or put you in touch with a supplier, as we think it is grown there as an ornamental shrub to a moderate extent.

Foam Bark.

W.K.H. (Townsville)—

The specimen is not the Peach Poison Bush, but the Foam Bark (*Jagera pseudorhus*). The bark of this tree has been used as a substitute for Quillaja for putting a "head" on beers and soft drinks. It has not come under suspicion as a poisonous plant, though it is very common in coastal scrubs in both North and South Queensland.

Spider Wort.

F.D. (Maleny)—

The plant bore no flowers, but is one of the Commelinaceæ or Spider Wort family, we should say *Commelina cyanea,* the commonest member of the family in Queensland. Plants of this family are not known to be poisonous or harmful in any way, and, in fact, some of them have been used as greens in cases of scurvy and lack of other vegetables at different times. Wandering Jew is a name commonly applied to several plants of this family.

Two Good Fodder Plants.

INQUIRER (Sydney)—

The specimens are determined correctly as *Alysicarpus vaginalis* and *Stylosanthes procumbens* respectively. We have two species of *Alysicarpus, A. vaginalis* and *A. rugosus,* and both are looked upon as very good fodders, particularly the latter. The *Stylosanthes* was originally recorded by F. M. Bailey as *Stylosanthes mucronata.* This species is in Greisbach's "Flora of the British West Indies," given as a synonym of *S. procumbens,* but in the Index Kewensis they are kept apart as distinct species. When this plant was first introduced it was simply looked upon as a pest in lawns in the neighbourhood of Townsville, but now it is regarded in North Queensland as an excellent fodder. Chemical analysis shows its feeding value to approximate to that of ordinary lucerne. When very rank the herb does not seem to be so much favoured by cattle as when it is growing under more adverse conditions. Under moist conditions, where growth is luxuriant, the plant is probably better for hay than for green fodder.

Tea Trees.

INQUIRER (Melbourne)—

Several varieties of *Melaleuca leucadendron* are common in Queensland, forming extensive forests, though the timber is not used to any great extent. The following notes on it are taken from "The Timbers and Forest Products of Queensland," by E. H. F. Swain, a work you could recommend to your correspondent as one he could obtain as a source of information on Queensland timbers. Mr. Swain states:—"The timber is compact, even, fine and short grained, tough and firm to cut, but having the defect of brittleness, and this defect increases with age. It has considerable durability in or out of weather, and is said to be comparatively white-ant resistant. In seasoning it is inclined to check and warp, which defects can be greatly reduced by sawing logs on the commercial quarter and seasoning slowly under cover. Brown Tea-tree is, according to Mr. Norman Wright, boatbuilder, of Brisbane, the most favoured timber for knees in large and small boats under cover. It is very tough. For natural bends or crooks it is better than Brush Box, Red Irongum, Spotted Irongum, or Honeysuckle Oak. It is extensively used for oyster-bed stakes. 'On the Burrum Coalfield,' Mr. C. J. J. Watson writes, 'I saw large areas of tea-tree swamps practically cut out for underground filling-up work, where pillars are made by putting pieces criss-cross from floor to roof in worked-out places where waste shale is being thrown.' With the bark removed it lasts well as a fence-rail, and has a very long life when used in the round, peeled, for rafters. It is being used by the Queensland Railway Department as sawn half-round sleepers for the building of the Mount Isa Railway line. When sawn it makes a satisfactory fruit-case timber, but somewhat hard to nail; and when tested for butter-boxes it imparted no harmful taste or taint to the butter, its weight and the narrow widths available were drawbacks. It is recommended by the Associated Country Sawmillers of New South Wales for veranda floorings. It has some possibilities for wood-carving and carved cabinet work." It was tested by the Council for Scientific and Industrial Research as a source of wood pulp, but was found to be scarcely worthy of consideration as a pulp wood. A disadvantage of the tree is that logs are generally only obtainable in small sizes.

Mushroom Poisoning.

H.S.P. (Stanthorpe)—

The specimens of toadstools were a semi-liquid mass, riddled with maggots when they reached us, hence determinations were impossible. Most mushrooms and toadstools, however, that occur in paddocks in Queensland are not poisonous, but the one that is most frequently reported as such is a tall white one, *Lepiota dolichaulos.* Symptoms of mushroom or toadstool poisoning are that there is often a latent period of from six to twelve hours, the victims remaining quite well. They are suddenly seized with terrible abdominal pains, excessive vomiting, and thirst. Diarrhœa may set in with mucous, bloody stools; on other occasions there may be constipation. A widening of the pupils of the eyes is also a common symptom, and dilation of the bladder with urine.

General Notes.

The Apiaries Act.

The Governor in Council has approved of the issue of a Proclamation bringing "*The Apiaries Act of* 1931" into operation as from the 24th October. This Act was assented to on the 15th October, and was enacted for the purpose of regulating and controlling the keeping of bees, and to control and restrict diseases and pests in relation to bees.

The abovementioned Act provides that the Governor in Council may declare any part of the State to be a district under the Act, and approval has accordingly been given to an Order in Council declaring the Pastoral Districts of Moreton and Darling Downs to be a district for the purposes of the Apiaries Act.

Protected Orchids.

It was noticed recently that there have been for sale in Brisbane some sprays of the large Phaius Orchid (*Phaius grandifolius*). The Department of Agriculture and Stock draws attention to the fact that this plant is protected under "*The Native Plants Protection Act of* 1930," and persons picking it on public lands are liable to prosecution under the Act. The flower spikes are several feet long and bear a number of brownish-red flowers with a central lip of a different colour. There is a rarer species with yellow flowers called *Phaius Bernaysii,* and this is also protected under the Act.

Cotton Board.

The Governor in Council has approved of the issue of an Order in Council amending the constitution of the Cotton Board with regard to the cotton districts.

The Order in Council constituting the Board provides that the growers' representatives on the Board shall be elected biennially, and that one representative shall be elected from each of six cotton districts. District No. 1 includes, amongst other areas, the area served by the railway stations on the Boyne Valley Line, excepting Barrimoon and Kalpowar. However, since the cotton districts were drafted, the Boyne Valley Line has been extended, and it is now necessary to alter the wording in District No. 1 to make clear that all stations on the line as far as and including Golembil shall be included in that district. The wording in No. 4 district also required amendment so as to indicate clearly that the stations from Monto to, and including, Barrimoon and Kalpowar on the Boyne Valley Line, should be included in District No. 4. The Order in Council issued, therefore, amends the wording in cotton districts Nos. 1 and 4.

A Poultry Mite Infesting Dwellings.

At this time of the year house infestation by a poultry mite, commonly known as the tropical fowl mite, is fairly frequent, said Mr. F. H. S. Roberts, of the Entomological Branch, Department of Agriculture and Stock, in the course of a recent radio address from 4QG. This mite is usually found associated with the domestic fowl, on which at times it occurs in very large numbers. House infestation is brought about mainly through the agency of house-frequenting birds such as the sparrow, starling, and pigeon, which pick up the mite from infested poultry yards. When these birds leave their nests in the eaves and ceilings after the young have been reared, the mites scatter over the house in search of food. Their bite is painless, but it leaves an intensely irritable area, causing acute itching. The first measure in the control of these pests is to locate and remove the nests of the birds from which they are coming. The infested portion of the affected premises should be thoroughly sprayed with an efficient insecticide. The bite may be relieved by bathing with a weak carbolic solution and applying an ointment composed of Beto. naphthol 15 parts, lard 100 parts, green soap 50 parts, and lanoline 10 parts. The mites may also become prevalent in a house from an adjacent poultry yard or from caged birds, such as parrots and canaries. Attention to cleanliness in these quarters and painting the perches with a solution of nicotine sulphate or blackleaf 40 will soon eradicate the pests.

Beef for the British Army.

The Minister for Agriculture and Stock has received a cablegram from the Agent-General's Office, London, to the following effect:—"War Office inviting tenders for 1,000,000 12 oz.-tins of corned beef returnable 6th January delivery 30th June next year specifications posted."

Staff Changes and Appointments.

Mr. F. P. Delf, of Arcadia, Magnetic Island, Townsville, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. Wm. E. Chandler, of Mowbullan House, Bunya Mountains, Dalby, has been appointed an Acting Inspector of Stock under the Diseases in Stock Acts.

Mr. J. P. H. Clark, Inspector of Stock at Wandoan, has been appointed also an Inspector under the Slaughtering and Brands Acts.

Mr. Robert Shepherd, Chairman of the Proserpine Co-operative Sugar Milling Association Limited, has been appointed Millowners' Representative on the Proserpine Local Sugar Cane Prices Board, vice Mr. C. C. Dodd, resigned.

Mr. S. R. C. Harding, of Timor, Injune, has been appointed an Honorary Inspector under the Diseases in Stock Acts.

Mr. Henry Hacker, F.E.S., Entomologist, and Mr. R. B. Morwood, M.Sc., Assistant Pathologist, Department of Agriculture and Stock, have been appointed also Inspectors under "*The Apiaries Act of* 1931."

Broom Millet Board.

The time fixed for the lodging of a petition in connection with the extension of the Broom Millet Board for a further term of three years closed on Monday, 12th October, without any request for a poll having been received from the growers. The necessary steps will therefore be taken to continue the operations of this pool as from the 1st November, 1931, to the 31st October, 1934. The present members, Messrs. Hans Niemeyer, Hatton Vale, and Erich Max Schneider, Binjour Plateau, have been returned unopposed and will be appointed to hold office for a further term of one year.

Wheat Conference.

A conference of the members of the State Wheat Board and representatives of the Queensland flour millers was convened by the Minister for Agriculture and Stock (Hon. H. F. Walker) and held recently at the Department of Agriculture and Stock. Those present included—

Representing the State Wheat Board—A. Hoskin (Chairman), H. C. C. Kirkegaard, T. W. McIntyre, W. J. Brimblecombe, A. E. Gibson (Government representative), J. E. Nussey, R. T. Phelps (manager), and J. A. Watson (secretary).

Representing the Flour Millers—R. J. Archibald, H. W. Luya, R. M. White (representing Brisbane Milling Company and Dominion Milling Company), T. P. and E. O'Brien, W. D. Phie (representing Defiance Milling Company), J. H. Allison (Warwick Farmers' Milling Company), G. P. Barnes and W. A. Dean (representing Barnes and Company, Limited), A. Pardy (representing Gillespie Brothers (Qld.) Limited); also

Mr. E. Graham (Under Secretary and Director of Marketing).

The conference was opened by the Minister for Agriculture and Stock, who occupied the chair.

Mr. Walker stated that the conference was held in accordance with the provisions of the agreement entered into by the parties concerned for the purpose of reviewing and discussing certain arrangements that had been made, and to consider any matters that might be deemed to be in the betterment of the wheat-growing and flour-milling interests in this State.

The matters of the reallocation of depots, liability for replacement of bags in feed stacks, appointment, duties, and remuneration of classifiers, fixation of standards of classification, and the acceptance of Currawa wheat by the millers were fully discussed, and decisions mutually arrived at which, it is thought, would be of benefit to the Board and millers concerned.

Another subject that was discussed was the quantity of wheat to be taken over by the millers for the 1931-32 season as provided for in the agreement. No finality was reached on this matter pending an announcement by the Premier relative to the attitude of the Government with regard to the renewal of the conditions now applicable to the wheat-growing and flour-milling industries in this State.

Mr. Walker was of the opinion that the decisions arrived at by the conference would be of material advantage to the harmonious working of the arrangements now existing between the Board and the millers, and of ultimate benefit to the wheatgrowers and those interested in the flour trade of the State.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE EXPECTANT MOTHER.

How strange it is, when one comes to think of it, that women should enter motherhood—the most important career in the world—without any special training! It should be the aim of every expectant mother to have a strong and healthy baby, and everything that affects the health of the mother affects also the wellbeing of her child. The mother's diet needs special thought for her food is providing the materials for building another body, and they should be the best that can be obtained. The best does not, of course, mean the most expensive. Milk, which is the most important, is also the cheapest of foods. Butter, cheese, and eggs are also among the most valuable of foods, and these four can be combined in many appetising ways. With them can be taken wholemeal bread, and any foods made with whole cereals. In addition, and especially if white bread is eaten, two or three table-spoonfuls of prepared bran should be included in the daily diet. Green vegetables, especially salads, should be eaten liberally every day if possible. Potatoes, carrots, tomatoes, other vegetables and fruits should also form part of the daily fare. Meat should be taken in strict moderation only once daily, and the best meats are liver, kidney, and tripe. We do not say that no other foods than these must be taken, but these are the most important for the building of sound bodies with strong bones and teeth.

A Deficient Diet.

A common Queensland diet consisting largely of white bread and scones, tea, meat, and sweet stuffs, with little fruit, vegetables, or milk, is a deficient diet. It fails to provide the elements necessary for building up the complicated and marvellous structures of the baby's body. The result may be compared to a house which is built out of poor, shoddy materials. It may look all right outside, but it will not stand wear, and is always needing repairs.

Every mother should know that seven months before baby is born the foundations of his teeth have been laid down, and that the building up of his first teeth is completed before birth. If the mother has been on a deficient diet, the milk teeth are of poor quality and soon decay, and this is a sign of weakness in the other structures of the baby's body.

Antenatal Care.

Pregnancy should be a time of increased fitness and wellbeing. With proper food, plenty of fresh air, reasonable exercise, and exposure to sunlight, and a little skilled supervision, almost every mother should have a normal labour and a healthy baby. This skilled supervision, which we call antenatal care, may be obtained from your medical attendant, or from a maternity hospital. In Brisbane we have two Antenatal Clinics open to all, but especially necessary for those who do not engage a doctor. These especially should not fail to attend one of these clinics in order to be assured that they will in all probability have a normal labour.

Use Common Sense.

By taking a little pains, and by making use of the advice which is freely provided, many expectant mothers would be saved from a number of discomforts and anxieties. Some would be saved from dangerous or even fatal illnesses. Many babies which are now born to live only a few days or a few weeks would grow into strong, healthy children if only every expectant mother would use her own common sense, and give a little thought to her own future health and the health of her child.

THE COUNTRY WOMAN.

By arrangement with the Domestic Science and Technical Services of the Department of Public Instruction, information of especial interest to country women is published regularly under this heading.

Text booklets are available, free of cost, on application to that Department.

SIMPLE COOKERY.

SPONGE SANDWICH.

Materials—3 eggs; ¾ cup sugar; 1 cup flour; 1 teaspoonful baking powder; 2 tablespoonfuls cold water; 2 tablespoonfuls jam; dripping; icing sugar.

Utensils—Bowl; whisk; sieve; 2 sandwich tins; knife.

Method—

1. Break eggs into a bowl.
2. Add sugar; whisk till thick.
3. Add flour mixed with baking-powder; add cold water.
4. Bake in two greased sandwich tins.
5. When cooked, join with jam; sprinkle top with icing sugar.

SHEPHERD'S PIE.

Materials—1 lb. steak; 2 teaspoonfuls salt; 2 pinches of pepper; ½ cup water; 6 large potatoes; ½ cup milk; 1 dessertspoonful lard.

Utensils—1 saucepan; wooden spoon; pie dish; potato-masher; knife; fork; mincer.

Method—

1. Pass meat through a mincing-machine.
2. Put meat into a saucepan.
3. Add water, salt, and pepper.
4. Stir with a wooden spoon till meat becomes a brown colour.
5. Add flour; cook for 3 minutes; put into a greased pie dish.
6. Cover thickly with mashed potatoes.
7. Bake in a hot oven till brown.

Potato Top.

1. Wash and peel potatoes.
2. Cut into even-sized pieces.
3. Put into a saucepan; cover with cold water if the potatoes are old.
4. Add salt; boil till tender.
5. Strain; dry; mash.
6. Add hot milk and butter.
7. Mix well with the back of a wooden spoon.
8. Spread on top of meat; make smooth with a knife; decorate with a fork.

BOILED ONIONS.

Materials—1 lb. onions; 1 teaspoonful salt; 1 pint water. For Sauce: 1 dessertspoonful lard or butter; 1 dessertspoonful flour; 1 cup milk; pinch of salt.

Utensils—1 saucepan; wooden spoon.

Method—

1. Wash and peel onions.
2. Put them into a saucepan; cover with hot water; add salt.
3. Boil till tender.
4. Strain; put into a hot vegetable dish.
5. Cover with white sauce.

RICE PUDDING.

Materials—2 oz. rice; ½ teaspoonful salt; 2 eggs; 1 pint milk; 1 tablespoonful sugar; grated nutmeg.

Utensils—Saucepan; strainer; pie dish; whisk; basin; grater.

Method—

1. Wash rice; put it into a saucepan of boiling water; add salt.
2. Boil till soft; strain.
3. Place rice into a greased pie dish.
4. Beat eggs in a basin; add milk and sugar.
5. Pour over rice; mix; grate nutmeg over top.
6. Bake in a slow oven for half an hour.

MEAT CROQUETTES.

Materials—1 lb. steak or cold meat; 1 tablespoonful lard; 1 tablespoonful flour; ½ cup milk or water; ½ teaspoonful salt; 2 pinches pepper; 1 cup white bread crumbs; 1 egg; 2 tablespoonfuls brown bread crumbs; dripping for frying.

Utensils—Mincing-machine; saucepan; wooden spoon; knife; frying-pan.

Method—

1. Pass meat through a mincing-machine.
2. Heat lard in a saucepan; when melted, add flour; blend well.
3. Add milk or water and meat; stir well.
4. Add salt, pepper, and bread crumbs; cook for 3 minutes; remove from fire.
5. Form into balls; dip in flour, beaten egg, and bread crumbs.
6. Shape into croquettes.
7. Fry in smoking fat; drain on brown paper; serve hot.

SULTANA SCONES.

Materials—½ lb. flour; ½ teaspoonful soda; 1 teaspoonful cream of tartar; ½ teaspoonful salt; 1 dessertspoonful lard; 2 tablespoonfuls sultanas; 1 tablespoonful sugar; ¾ cup milk.

Utensils—Bowl; sieve; cutter; brush; baking-tin.

Method—

1. Sift flour, soda, cream of tartar, and salt into a bowl.
2. Rub in lard; add sultanas and sugar.
3. Make into a soft dough with milk.
4. Cut into rounds; brush over with milk; put on a floured tin.
5. Bake in a hot oven for 15 minutes.

ONION SAUCE.

Materials—4 small onions; 1 teaspoonful salt; 1 tablespoonful flour; 1 tablespoonful butter; ½ pint milk.

Utensils—Knife; small saucepan; wooden spoon.

Method—

1. Peel onions; put them into a saucepan; add water and half the salt.
2. Boil for 30 minutes or until tender; strain; turn onions out on plate; cut them up into small pieces.
3. Melt butter or dripping in a saucepan; add flour; heat, stirring until the mixture is smooth.
4. Add milk gradually; boil for 3 minutes; add cut-up onions and remainder of salt; boil for 5 minutes.

PARSLEY SAUCE.

Materials—1 dessertspoonful butter; 1 dessertspoonful flour; ½ pint milk; 1 dessertspoonful chopped parsley.

Utensils—Saucepan; wooden spoon; knife.

Method—

1. Heat butter in a saucepan; add flour; stir till smooth; add milk gradually.
2. Cook for 3 minutes, stirring continually.
3. Remove from fire; add chopped parsley; stir well.

BOILED CHOKOES.

Materials—Chokoes; $\frac{1}{4}$ teaspoonful salt to each choko.

Utensils—Bowl; knife; saucepan.

Method—

1. Wash chokoes; peel them under water; cut them into even-sized pieces.
2. Heat water in a saucepan to boiling point; add salt.
3. Put chokoes into the saucepan; boil till tender; drain; serve with white sauce or melted butter.

Notes—

1. Chokoes are peeled under water to prevent staining the hands by the juice.
2. Vegetable marrow may be prepared, cooked, and served in the same way as chokoes.
3. Pumpkins may be prepared and cooked similarly; when tender the water should be drained off, the pumpkin well dried and mashed; butter, pepper, and salt should be added, and well stirred in before serving.
4. Carrots should not be peeled; the soft outside skin is easily removed by scraping; when prepared they are cooked in the same way as chokoes; it is necessary to allow 45 to 60 minutes for boiling carrots.
5. Turnips must be peeled; they must be boiled for 45 to 60 minutes; when tender they may be mashed, butter, salt, and pepper being added; or they may be served whole with white sauce.
6. Chokoes, pumpkin, and vegetable marrow may be baked in the oven with meat in the same way as potatoes.
7. Carrots and turnips may be boiled with corned meat; they are also sliced and added to haricot stews.

INVALID COOKERY.

LIQUIDS AND THEIR PREPARATION.

SECTION I.

ALBUMEN WATER.

Utensils—Basin; tablespoon; scissors; knife; cup and saucer.

Materials—1 white of egg, 2 tablespoonfuls boiled water; pinch of salt or sugar.

Method—

1. Put white of egg into a basin; cut it through and through with a pair of scissors or a knife.
2. Add cold boiled water, salt or sugar.
3. Strain into a cup; serve.

APPLE WATER.

Utensils—Jug; knife; squeezer; wooden spoon; tablespoon; teaspoon; strainer; tumbler.

Materials—1 cooking apple; 1 tablespoonful sugar; 1 pint water; 1 teaspoonful lemon juice; 1 oz. lemon peel.

Method—

1. Slice apple into jug.
2. Add sugar, lemon juice, and peel.
3. Add boiling water.
4. Stir with wooden spoon.
5. Cover; strain when cold.

BARLEY WATER (DECOCTION).

Utensils—Saucepan; strainer; squeezer; knife; tablespoon; teaspoon; cup and saucer.

Materials—3 tablespoonfuls barley; $1\frac{1}{2}$ pint boiling water; 1 teaspoonful sugar; 1 teaspoonful lemon juice.

Method—

1. Wash barley; put it into a saucepan.
2. Add water; simmer for two hours.
3. Strain; add lemon juice and sugar.

BARLEY WATER (INFUSION).

Utensils—Jug; basin; squeezer; strainer; tumbler; knife; teaspoon; tablespoon.

Materials—1 lump sugar; tablespoonful barley; 3 gills water; 1 teaspoonful lemon juice; 1 oz. lemon rind.

Method—

1. Wash barley.
2. Put barley, sugar, lemon juice, and rind into a jug.
3. Add boiling water.
4. Cover; strain when cold.

BLACK CURRANT TEA.

Utensils—Jug; dessertspoon; teaspoon; squeezer; knife; tumbler.

Materials—1 dessertspoonful black currant jam; 1 teaspoonful lemon juice; 1 teaspoonful castor sugar; ½ pint boiling water.

Method—

1. Put jam, sugar, lemon juice into a jug.
2. Pour in boiling water.
3. Stir well; cover.
4. Stand near fire for twenty minutes.
5. Strain for use.

Note.—Any acid jam may be similarly used to make a refreshing drink.

CHOCOLATE.

Utensils—Saucepan; knife; whisk; jug; strainer; cup and saucer.

Materials—1 cup milk; 1 oz. chocolate; 1 egg.

Method—

1. Put milk into a saucepan; shred chocolate into it.
2. Stir over fire until the chocolate is dissolved.
3. Whisk an egg in a jug.
4. Strain chocolate over it.
5. Whisk till frothy.

LEMONADE.

Utensils—Jug; strainer; tumbler; knife.

Materials—1 lemon; 3 lumps sugar; 1 pint boiling water.

Method—

1. Put a small piece of rind into a jug.
2. Strain juice into the jug.
3. Add boiling water.

LEMON WHEY.

Utensils—Saucepan; knife; squeezer; strainer; tumbler.

Materials—1 gill milk; juice of ½ lemon; 1 lump sugar.

Method—

1. Put milk and sugar into a saucepan.
2. Bring to the boil.
3. Add lemon juice.
4. Strain; serve hot.

Note.—Wine or rennet may be used instead of lemon juice.

OATMEAL DRINK.

Utensils—Saucepan; strainer; cup and saucer; teaspoon.

Materials—1 tablespoonful oatmeal; ½ pint milk; ½ teaspoonful butter; pinch of salt and pepper.

Method—

1. Put oatmeal, butter, salt, and pepper into saucepan.
2. Add boiling milk.
3. Boil five minutes.
4. Strain; serve.

RICE WATER.

Utensils—Basin; saucepan; strainer; tumbler or cup and saucer; knife.

Materials—1 oz. rice; 1 quart water; 1 oz. cinnamon stick; pinch salt.

Method—

1. Wash rice.
2. Put rice, cinnamon, water, and salt into saucepan.
3. Simmer one hour.
4. Strain; serve hot or cold.

TOAST WATER.

Utensils—Jug; squeezer; teaspoon; muslin; tumbler; knife.

Materials—1 piece of toasted crust; 1 pint cold water; 3 drops lemon juice; 1 teaspoonful sugar.

Method—

1. Break up toast; put it into a jug; add sugar.
2. Add cold water; let stand till the water is straw coloured.
3. Add lemon juice.
4. Strain through muslin.

FRUIT PRESERVING.

APRICOT JAM.

Method—

1. Peel apricots; cut them into halves.
2. Remove stones; crack stones and remove kernels.
3. Put ¼ lb. kernels into cold water; bring to boil and peel.
4. Put apricots and part of sugar into a bowl in layers; allow fruit to stand twelve hours.
5. Put fruit and syrup into preserving pan with remainder of sugar, blanched kernels, and water.
6. Allow to cook slowly until apricots are soft and transparent.
7. When slightly cool pour into warm jars.
8. Cover down airtight.

Utensils—Knife, dish, preserving pan, saucepan, basin, jam jars, wooden spoon.

Materials—Apricots; 1 lb. crystallised sugar to each pound of fruit weighed without kernels.

Note.—Apricot jam may be made without peeling apricots.

APRICOT JAM MADE FROM DRIED APRICOTS.

Method—

1. Put apricots into a bowl; cover with cold water.
2. Wash fruit well; drain; cut fruit into halves; return apricots to bowl.
3. Cover with boiling water; allow to stand till the apricots are well soaked and plump.
4. Put fruit and water into a preserving pan.
5. Boil till the fruit is clear; add sugar, lemon juice, and almonds.
6. Boil till a small quantity jellies on a saucer.
7. Bottle, seal, cover securely.

Utensils—Bowl, cup, wooden spoon, squeezer.

Materials—1 lb. dried apricots; 8 cups boiling water, 8 cups sugar, 3 lemons, 6 blanched almonds.

Note.—Any dried fruit may be used in this way.

CRYSTALLISED APRICOTS.

Method—

1. Cut sound ripe apricots into halves.
2. Make a syrup of sugar and water.
3. Drop apricots into syrup; simmer ten minutes.
4. Lift out.
5. Drain overnight.
6. Return to syrup next day, and simmer three minutes.
7. Repeat process six times.
8. Spread out to dry thoroughly in a very cool oven.
9. Pack away in boxes between sheets of paper.

Utensils—Knife, saucepan, large dish.

Materials—Apricots; 1 lb. sugar to ½ pint water.

PRESERVED APRICOTS, NECTARINES, OR LARGE PLUMS.

Method—

1. Put firm apricots into hot water; wipe them till thoroughly dry; peel, stone, and halve if necessary.
2. Put fruit into a preserving pan; cover with rain-water.
3. Bring to boiling point; lift fruit out; drain.
4. Pack fruit into bottles, letting them settle down gradually.
5. Add 1 lb. sugar to each pint of liquor in which the fruit was boiled; boil for ten minutes; remove skum.
6. Strain syrup through flannel into a basin.
7. Ladle syrup into a jug; place a knitting needle in each bottle of fruit; add boiling syrup till the bottle overflows.
8. Seal down immediately; test by turning upside down.

Utensils—Bowl, jug, cup, preserving pan, cloth, strainer, flannel, knitting needle, lightning jars.

Materials—1 lb. sugar and 1 pint water to each 1-quart jar of fruit.

PRESERVED APRICOTS, NECTARINES, OR LARGE PLUMS (BY STEAM PRESSURE).

Method—

1. Put firm apricots into hot water; lift them out and dry them thoroughly.
2. Pack carefully into preserving jars; put a knitting needle into the jars.
3. Make a syrup of 1 cup of sugar to 1 cup of water.
4. Boil the syrup for three minutes; strain it into a jug.
5. Pour syrup over the fruit in the jars, taking care to fill each jar to the brim.
6. Put on covers.
7. Pack jars into the canner, taking care to prevent their knocking against one another.
8. Steam for time required to make fruit tender at 160 degrees.
9. Allow bottles to remain in canner till partially cooled down; fill up to overflowing with fruit, if necessary, and hot syrup.
10. Put on rings and covers immediately; turn upside down.

Utensils—Bowl, cloth, jars, preserving pan, cup, knitting needle, jug, canner.

Materials—Apricots, nectarines, or plums; 1 lb. of sugar to each pint of water.

DRIED APRICOTS OR OTHER STONE FRUIT.

Method—

1. Remove seed from fruit; press each apricot out flat.
2. Put them on flat tins in a warm oven for twelve hours.
3. Turn each apricot; return to oven.
4. Allow the fruit to remain in the oven till all moisture has evaporated.
5. Pack into boxes with sheets of white paper between the layers.

Utensils—Knife, flat tins, box, white paper.

Materials—Apricots or other stone fruit.

Notes.—

1. Fruit cannot be dried in a gas oven.

2. In dry, warm weather fruit may be dried out of doors; while drying the trays of fruit should be covered with muslin or net to keep off the insects.

PRESERVED PEACHES.

Method—

1. Peel the peaches carefully.
2. Place the peeled peaches in a single layer in a preserving pan.
3. Cover with tank water; simmer till the fruit is just tender.
4. Lift fruit out, pack carefully in jars.
5. Strain the liquor in which the fruit was cooked.
6. Return it to the preserving pan; add ½ lb. of sugar to each pint of liquor.
7. Bring to the boiling point; boil quickly for ten minutes, remove scum.
8. Cover fruit with boiling syrup till it overflows the lip of the bottle.
9. Place lid on immediately; seal; test for the presence of air or escape of syrup by turning the bottle upside down.
10. When cool, wash the bottles in blue water; wipe very carefully, store in a dark place.

Utensils—Bowl, silver knife, wooden spoon, spoon, preserving pan, cup, jug, flannel strainer, 1-quart preserving jars.

Materials—Peaches; 1 lb. sugar to 1 quart water for each jar.

PRESERVED PLUMS.

Method—

1. Wash and wipe plums carefully.
2. Put layer of sugar over bottom of jar.
3. Add layers of plums and sugar alternately until jar is filled to brim.
4. Fix rubber and cover securely.
5. Store until sugar is dissolved.

Utensils—Jars.

Materials—Large well-flavoured plums such as magnum bonum; 1½ lb. brewer's crystals to 1 lb. fruit.

PRESERVED PLUMS (SECOND METHOD, IN WATER).

Method—

1. Stem, wash, and wipe plums.
2. Pack carefully into bottles; put in a knitting needle.
3. Fill up bottles over the brim with boiling water.
4. Seal carefully, test by turning the bottle upside down.
5. Store in a dark place.

Utensils—Bowl, cloth, jug, cup, spoon, knitting needle, quart jars.

Materials—1 quart plums; 1 pint water to each jar.

PEACH JAM.

Method—

1. Rub, pare, and cut up peaches; remove stones.
2. Put fruit into preserving pan; add sufficient water to cover bottom of pan.
3. Bring to boiling point; boil for ten minutes.
4. Add sugar and lemon juice; boil for thirty minutes or till a small quantity jellies on a cool plate.
5. Bottle, seal, and cover.

Utensils—Bowl, knife, preserving pan, cup, plate, wooden spoon, jars.

Materials—Peaches; ¾ to 1 cup sugar to each cup of pulp; 1 lemon to 4 cups pulp.

PEACH CONSERVE.

Method—

1. Wash fruit, rub it well, peel if necessary.
2. Cut into halves and remove seeds.
3. Put sugar and water into a preserving pan, bring to boiling point.
4. Add fruit; boil until tender.
5. Lift out fruit carefully.
6. Boil syrup rapidly for fifteen minutes, pour it over fruit to overflowing; seal jars.

Utensils—Preserving pan, knife, wooden spoon, jars.

Materials—Peaches; 1 cup sugar to 1 cup water.

Note.—Quinces, cooking pears, apples, or plums may be used for this conserve.

LAUNDRY WORK.

SUMMARY.

Treatment of Clothes that may be Boiled.

Notes—

1. All stains and dirty marks must be removed.
2. The clothes must be kept a clear white colour.
3. The material must not be injured.

Processes.

1. Soak them for at least 12 hours in cold water to loosen dirt.
2. Move them about vigorously in steeping water; wring out; place in tubs of clean warm water.
3. Wash out dirty marks by rubbing one part of the garment against another part, using soap to loosen the dirt and taking the cleaner articles first; wring out and place in clean warm water.
4. Rinse through water till the soap and dirty water are removed; wring.
5. Put into boiler; boil for 20 minutes to improve the colour.
6. Lift out of boiler; strain off soapy water.
7. Rinse through clean cold water to remove soap; wring.
8. Pass articles that are to be starched through boiled starch.
9. Shake well; peg out to dry in the open air if possible.

Treatment of Clothes that may Not be Boiled.

Notes—

1. Flannels and woollen must be sorted into—
   (*a*) White flannels.
   (*b*) Jaeger and natural-colour woollens.
   (*c*) Coloured flannels and woollens.
2. Woollen garments shrink if allowed to lie about wet.
3. If soap is rubbed on flannels, the soda in it hardens them and turns white wool yellow.
4. Cold or hot water injures flannels and woollens; warm water is best.
5. Woollens should not be dried in the sun nor directly in front of a fire. They should not be allowed to steam.

Treatment of White Flannels.

1. Shake them to remove dust.
2. Prepare warm water by mixing it in the proportion of 2 quarts of boiling water to 3 quarts of cold water.
3. Add enough melted soap to make a lather; add a few drops of ammonia to make the water soft and to remove grease.
4. Squeeze the articles gently in the water between the hands, but do not rub them. Turn them inside out and repeat the process till they are clean.
5. Rinse them in water the same heat until all the soap is removed.
6. Fold the articles and pass them through a wringer two or three times.
7. Shake them well to raise the nap.
8. Dry them in the open air, if possible, hanging them up by the thickest part.
9. Iron when nearly dry. Cotton bands must be ironed till quite dry.

Note.—Jaeger and natural colour woollens may be washed in the same way, except that they may be steeped in the prepared water (warm water, melted soap, and ammonia) for 20 minutes, the vessel being covered to prevent the escape of the ammonia.

Treatment of Coloured Woollen Garments.

These may be washed in the same way as white woollens, with the omission of ammonia, because it affects certain colours. The articles must be washed and dried quickly to prevent the colours from running. Salt is added to the rinsing water to assist in fixing the colour. One tablespoonful of vinegar to 4 quarts of water may be used to brighten colours.

Orchard Notes for December.

THE COASTAL DISTRICTS.

THE planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime-sulphur, potassium, or sodium sulphide washes. Borer should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and melons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

EARLY ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground

for fruit fly and codlin moth, as well as of fungi, such as those producing the brown and ripe rots. Early ripening fruits should, therefore, be carefuly graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codlin moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

Farm Notes for December.

ALTHOUGH November is regarded generally as the best period for planting the main maize crop, on account of the tasseling period harmonising later on with the summer rains, December planting may be carried out in districts where early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of ensilage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state; consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windrows until the tops ore dry enough to twist off. If a ready market is not

available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary; otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway and sending their taproots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work.

THE BENEFIT OF GREEN MANURE.

"Green" Manuring—the turning under of a growing crop—benefits the soil in two ways. It enriches the soil, in the first place, by supplying it with a considerable amount of readily available plant-food, and, in the second place, by adding humus, and thus improving the soil's texture and its power of absorbing and retaining moisture. When a manure crop is buried, the surface soil becomes enriched by the nourishing materials which the crop during the period of its growth had drawn from the air and from the lower portions of the subsoil, and this material is now placed within the reach of the succeeding crop.

During the growth of the plant the soil has, in addition, been stirred up and disintegrated by the development of the roots. When ploughed under, provided sufficient moisture and warmth are present, the buried mass decomposes with more or less rapidity.

A further important result is the formation of carbonic acid by the decomposition of the buried crop. Carbonic acid is given off abundantly in the fermentation of the mass, and assists in the disintegration of the soil and in rendering available the plant-food contained in it.

Green manuring is effective both in sandy and on heavy clay soils, and indeed on all soils deficient in humus. On sandy soils the effect of green manuring is to consolidate the soil, the humus formed binding the particles together. On clay soils, the effect of the addition of humus and the production of carbonic acid is to loosen and aerate the particles. When conditions as to warmth and moisture are favourable, and the crop decomposes fairly rapidly, the production of soluble plant-food proceeds with considerable rapidity. This is especially the case in respect of nitrogen, which is the principal manurial ingredient obtained from green manure. Nitrification (that is, the conversion of the nitrogenuous material of the plant into soluble nitrates) takes place quite rapidly. In sandy soils, green manure nitrifies more rapidly than manures like dried blood, bonedust, &c., and only a little more slowly than ammonium sulphate; while in stiff clay soil the green crop nitrifies very much more rapidly than either sulphate of ammonia or animal manures.

With regard to the kind of crop to be used for the purpose of green manuring, a good deal of latitude is permissible. Any crop that is rapid and luxuriant in growth, and that can be readily turned under, is suitable for the purpose, and the selection will be guided by considerations such as the time of year at which it is to be grown, its suitability to soil and district, &c. Among the most effective crops for the purpose are leguminous plants, such as clover, velvet beans, peas, &c., since these are specially valuable on account of their power of obtaining their nitrogen from the air. They are, therefore, specially suitable for soils poor in nitrogen, and are of high value in enriching the soil with this ingredient.

It must be borne in mind in all cases that green manure depends for its success upon the existence of conditions favourable to the decomposition of the buried green crop—namely, sufficient warmth and moisture. If the land is quite dry, the crop will remain buried without decomposing for a considerable period, and its beneficial effect will be deferred.

THE JOURNAL IN AMERICA.

Writing from Yakima, Washington, U.S.A., an American farmer says, inter alia, "The 'Queensland Agricultural Journal' is an interesting publication, and I would like to know the subscription price to farmers in America."

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	November, 1931.		December, 1931.		MOONRISE. Nov., 1931.	MOONRISE. Dec., 1931.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5.5	6.7	4.52	6.30	11.28	11.41
2	5.4	6.7	4.52	6.30	11.28	...
					a.m.	a.m.
3	5.4	6.8	4.52	6.31	12.19	12.16
4	5.3	6.8	4.53	6.32	1.3	12.48
5	5.2	6.9	4.53	6.33	1.41	1.21
6	5.2	6.10	4.53	6.34	2.15	1.54
7	5.1	6.10	4.53	6.34	2.47	2.31
8	5.1	6.11	4.53	6.35	3.23	3.13
9	5.0	6.12	4.53	6.35	3.58	4.4
10	4.59	6.13	4.54	6.36	4.40	5.2
11	4.59	6.14	4.54	6.37	5.23	6.4
12	4.58	6.15	4.54	6.38	6.21	7.7
13	4.58	6.16	4.54	6.38	7.20	8.8
14	4.57	6.16	4.54	6.39	8.21	9.9
15	4.57	6.17	4.54	6.39	9.24	10.8
16	4.56	6.18	4.55	6.40	10.23	11.1
17	4.56	6.19	4.55	6.40	11.21	11.54
					p.m.	p.m.
18	4.56	6.20	4.56	6.41	12.15	12.42
19	4.55	6.21	4.56	6.41	1.9	1.34
20	4.55	6.22	4.57	6.42	2.1	2.30
21	4.55	6.23	4.57	6.43	2.53	3.25
22	4.54	6.23	4.58	6.43	3.43	4.24
23	4.54	6.24	4.58	6.44	4.39	5.21
24	4.53	6.25	4.59	6.44	5.36	6.19
25	4.53	6.25	4.59	6.45	6.34	7.17
26	4.53	6.26	5.0	6.45	7.27	8.11
27	4.53	6.27	5.0	6.46	8.29	9.0
28	4.52	6.27	5.1	6.46	9.25	9.41
29	4.52	6.28	5.1	6.46	10.16	10.16
30	4.52	6.29	5.2	6.47	11.2	10.50
31			5.3	6.47		11.23

Phases of the Moon, Occultations, &c.

3 Nov.	☽ Last Quarter	5 17 p.m.
10 ,,	● New Moon	8 55 a.m.
17 ,,	☾ First Quarter	12 13 p.m.
25 ,,	○ Full Moon	5 10 p.m.

Perigee, 9th November, 1.0 a.m.
Apogee, 21st November, 2.48 a.m.

The Moon in its monthly round will pass through the following constellations: It will be in Gemini on the 1st and 2nd November; in Cancer to 3rd; in Leo to the 6th; in Virgo to the 9th; in Libra to the 10th; in Scorpio to the 11th; in Ophiuchus to the 12th; in Sagittarius to the 15th; in Capricornus to the 17th; in Aquarius to the 19th; in Pisces to the 22nd; in Aries to the 24th; in Taurus to the 27th; in Gemini to the 29th; in Cancer to the 30th.

Mercury will be in Libra on 1st November, and pass through Scorpio into Sagittarius to 30th November; Venus will be passing through Libra into Sagittarius; Mars from Libra, through Scorpio into Ophiuchus; Jupiter will be in Leo and Saturn in Sagittarius.

Those on the look-out for the November meteors, shortly after the middle of the month, may be well rewarded by the appearance of precursors of the Leonid-swarm, which is due more particularly in two years time.

The so-called conjunctions of Moon with a planet will occur this month either in daylight and too near the Sun to be observable, or as in the case of Saturn, when below the horizon in Queensland; but with binoculars Jupiter may be seen 3 degrees south of the Moon in the north-west about 10 a.m. on the 4th.

Mercury will rise about 26 minutes after the Sun on the 1st November, and set 38 minutes after it; on the 15th it will rise 53 minutes after the Sun and set one hour fifteen minutes after it.

Venus will rise 47 minutes after the Sun on the 1st and set one hour five minutes after it; on the 15th it will rise one hour four minutes after the Sun and set one hour twenty-two minutes after it.

Mars will rise at 6.24 a.m. and set at 7.56 p.m. on the 1st; on the 15th it will rise at 6.9 a.m. and set at 7.49 p.m.

Jupiter will rise at 1.20 a.m. and set at 12.15 p.m. on the 1st; on the 15th it will rise at 12.31 a.m. and set at 11.25 a.m.

Saturn will rise at 9.45 a.m. and set at 11.21 p.m. on the 1st; on the 15th it will rise at 8.54 a.m. and set at 10.32 p.m.

The Southern Cross will be so low down at sunset as to be practically invisible in Queensland until the early morning, when it may be seen lying on one side, 30 degrees east of the south pole; at 4 a.m. on the 1st and 1 a.m. on the 30th.

3 Dec.	☽ Last Quarter	2 51 a.m.
9 ,,	● New Moon	8 16 p.m.
17 ,,	☾ First Quarter	8 43 a.m.
25 ,,	○ Full Moon	9 24 a.m.

Perigee, 7th December, 4.6 a.m.
Apogee, 18th December, 9.42 p.m.

Early in December, the three planets, Mars, Mercury and Venus will be above the western horizon very near to one another, affording a remarkably interesting spectacle after sunset. At first Mercury and Venus will be apparently nearest together, Mars being lower down and less prominent.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts **FREE** on prepayment of **One Shilling** to cover postage. Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXVI. 1 DECEMBER, 1931. PART 6.

Event and Comment.

Dairy Production in Queensland.

MR. GRAHAM, Under Secretary for Agriculture and Stock, in his annual report to the Minister (Hon. Harry F. Walker) mentions the remarkable development in the dairying industry in Queensland, and his comprehensive review of rural progress covers many points of interest, not only to primary producers but to the community in general. He states that the excellent butter output of the 1929-30 term, until then our peak year in dairy production, was exceeded by 16,790,490 lb. The total quantity of butter manufactured was 92,894,101 lb., eloquent evidence of the remarkable progress of the dairying industry in this State. Seasonal conditions were generally favourable, and consequently production was uniform throughout the period.

Home consumption figures showed a slight decline, and oversea markets fluctuated considerably. The industry, like all others, was affected by the general economic situation. The first half of the year was a period of falling values, bottom being reached in December; from then on a recovery was made, to be followed by a depression to the mid-year level in the closing month of the term.

A very satisfactory feature of the year in dairying was a decided enhancement in the quality of the product. The actual percentages were 88.19 for choice and first, 8.26 for second, and 3.55 for third grade. It is obvious, however, that there still exists room for grade improvement, and educative effort by the Department is being directed unremittingly to the gradual elimination of the lower grades. Quality improvement is, however, a progressive factor in the industry, as will be confirmed by reference to previous annual reports.

It is being brought right home to the producer that products below grade mean a direct personal loss, and as a consequence modern methods in dairy practice are being adopted more widely.

Throughout the year a greater uniformity in condition, body, and texture of butter, and maintenance of moisture content were observed. There was more uniformity in colour and salting also in packing and finish. All this is evidence of a high standard of factory efficiency which is characteristic of the industry in this State.

A remarkable point about dairy production in Queensland is its extending development on the tropical coast and northern tablelands. The quality of the butter produced in those regions has attained a very high standard; in fact, the butter submitted for export from far northern districts comprised 99 per cent. of choice and first grade. In the continuous and fresh butter class at this year's dairy show in Brisbane, butter from the Atherton Tableland gained the highest award. The industry in the North has already become a favourable influence in our export trade.

Cheese production also showed a marked increase in the first half of the year, in comparison with the output of the corresponding period in the previous term, but later months showed a decline due to the depreciation in market values for this commodity. In spite of this, however, the output for the year was 1,272,422 lb. in excess of the production of 1929-30. The total quantity manufactured for the year was 13,642,237 lb. Cheese grading results show a general improvement in quality. The assistance of Departmental officers was always available where defects in treatment or manufacture existed, and an excellent spirit of co-operation between officials and manufacturers was maintained. This mutual understanding and service is having undoubtedly a marked influence for good.

Herd and Pasture Improvement.

HERD improvement, of course, claimed the active and continuous interest of the Department with gratifying results to the industry as a whole. Breeders of purebred stock are increasing in number, and their enterprise is meeting with its due reward. The system of production recording operated by the Department is well supported, and the influence of these activities on the dairy herds of the State is already being made manifest. Stock submitted for production recording during the year increased approximately 100 per cent. in number over previous listings. The same applies in large measure to grade herds. Generally there is a greater demand for high-quality stock.

In pasture improvement, Departmental effort has been spread more widely, and experiments in renovation and rotational grazing are in progress. In this work, dairy farmers are showing an appreciable interest.

It is regrettable, however, that fodder conservation is not being practised to the extent that the interests of the industry make imperative. Dairy farmers possess the common human characteristic of a short memory, in seasons of plenty, of previous hard times, and lay up little store for the lean years that will inevitably recur. The old-established principle of fodder conservation when stock food is abundant, though no doubt duly appreciated, is applied in practice all too rarely. The importance of this form of live stock and cheque-book insurance is stressed strongly and continuously by the Department in carrying out its comprehensive educational programme.

Factory Efficiency.

ON the technical side of the dairying industry it was a year of remarkable progress, and it is not extravagant to claim that in few countries, if any, is the industry better served. In addition to the modernisation of the existing plants, complete new factories were erected at Wondai, Beaudesert, and Kingston, and all are impressive examples of the high standards of technical and scientific efficiency attained by the Queensland dairy industry.

Dairying, like other primary industries, is feeling the influence of the present-day "back to the land" movement. The regularity of its returns and other economic advantages, in the circumstances, are attracting, no doubt, the greater number who are responding to the call of rural life in this period of national reconstruction. Share dairying and the leasing of dairy lands are extending where other systems of settlement are not available. Many landowners outside the dairying ranks who have felt the pinch of lower prices in other branches of husbandry are also being attracted to the industry by its prospect of more stabilised values.

It is noticeable, however, that the general advance in efficient dairy management is not so much in evidence on the dual-controlled farm as on that of the owner-dairyman. On the whole, the dairy farmer working his own property is to-day the most prosperous and contented producer in rural industry.

Pig Raising.

COMMENTING on conditions in the pig raising industry during the year, Mr. Graham said that seasonal circumstances were favourable throughout the districts in which the industry is carried on. Standards are improving and production was well maintained. Prices for pigs, unfortunately, fell far below the values of previous years, and as much as 50 per cent. under the 1929 level. In the last month of the year, however, values advanced from 3½d. a lb. to 4½d. a lb. for prime baconers, but according to computations of two years ago, when it was considered that 7d. a lb. dressed weight was the lowest price acceptable for best baconers consistent with reasonably profitable production, those prices were well under cost. The frozen pork trade provided fair prospects for greater development, and overseas consignments won high commendation on the London market where, in October, porkers brought from 6¾d. to 8½d. ex store, and baconers from 6¾d. to 8¾d. c.i.f.e. Though these values were not constant, they indicate the export possibilities under normal business conditions. The economic circumstances of the industry were studied closely, and every encouragement given to co-operative effort and service.

With the object of gaining data for the guidance of farmers, pig-feeding experiments were conducted at the Yeerongpilly Stock Experiment Station, the results of which have been duly disseminated. A system of regular inspection of pigs and piggeries by dairy and stock inspectors, with the object of improving general practice in the industry, was instituted in the course of the year. The system is working well, and producers are co-operating actively in it and conforming cheerfully to requirements of the Department. To date over 2,000 inspections have been made. That departmental efforts under the scheme are appreciated by the producers is evident in improvements of both stock and their environment.

In the North the industry is progressing along sound lines, and pig raising in that division of the State is now well established.

The total value of the industry for the calendar year (1930) was £1,702,000. Pigs numbered 217,528, as compared with 236,037 at the end of 1929.

Departmental Publicity.

ANOTHER interesting phase of the year's work to which reference was made by Mr. Graham in the course of his annual review was the dissemination of agricultural information to farmers. He said:—

> A system of effective publicity is recognised as one of the essential activities of the Department, and in this regard an extensive and efficient service was maintained throughout the year.
>
> The "Queensland Agricultural Journal" has now completed its thirty-fourth year of publication. In recent years it has doubled in circulation, and it continues to fulfil satisfactorily the purposes for which it was established in 1897. The journal maintains a high standard of useful service in the regular dissemination of information of practical value to the farmer and stockbreeder. It serves as an effective means of making known facts to farmers on various phases of rural industry.
>
> Exact knowledge is necessary if agriculture is to be made adaptable to the constant changes in its natural and economic environment. The latest discoveries and developments in the science and practice of agriculture must be conveyed to the farmer in a readable and readily digestible form, and that is the function of the journal and other departmental publications.
>
> The value of scientific research is recognised by all progressive agriculturists. Comprehending the objects and methods of research, for which the farm is the natural laboratory, it is they who are its most efficient supporters. Through it they know that time can be saved and their efforts directed into profitable channels, and useless struggles and waste avoided. They also know that scientific discovery is one of those things that soon becomes known throughout the world, and if we fail to make use of new knowledge, competing countries assuredly will not. By means of the journal, and our other publications, that need for information, both scientific and technical, is met so far as it comes within the scope of departmental activities. Dealing with all those phases of agriculture which are bracketed with its scientific, practical and economic interests and progress, the journal is of definite value to all engaged in primary production. Its usefulness is assured by regular contributions, many of which are the results of original research, from officers engaged in directive, educative, and specialised work.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART XXI.

(f) Sugar Prices.

THE price of sugar since the industry was first started in Queensland has been subject to many fluctuations, and it is now exceedingly difficult to get particulars as to old-time prices.

The prices received by the Alexandra Plantation at Mackay for sugar, according to "A Report on the Sugar Industry in Queensland," by Mr. H. Ling Roth, are given as under:—

Year.	Nett Return Per Ton. £ s. d.	Year.	Nett Return Per Ton. £ s. d.
1868	32 0 0	1874	18 5 1
1869	31 14 0	1875	22 16 1
1870	28 16 0	1876	24 8 3
1871	25 19 9	1877	21 4 9
1872	25 5 10	1878	20 5 3
1873	24 0 0		

It is not stated whether these prices were obtained for brown or white sugars, but it is pointed out that in the earlier years Queensland profited by protection, but when export began the balance of the sugars manufactured above the amount consumed in Queensland fell to its value on the world's market.

The next information I have been able to secure is from Messrs. James Stodart and Company, merchants, of Brisbane, who have kindly supplied the following figures for Yengarie white sugar:—

AVERAGE PRICE OF YENGARIE (QUEENSLAND) SUGARS FROM 1876 TO 1883.

Year.	Price. £ s. d.	Year.	Price. £ s. d.
1876	35 5 6	1880	32 4 1
1877	35 14 3	1881	32 10 1
1878	34 15 0	1882	33 5 0
1879	32 8 6	1883	31 18 8

Mr. E. B. Forrest, in giving evidence before the 1889 Royal Commission, stated he was Managing Director, Parbury, Lamb, and Company, who were agents for the Colonial Sugar Refining Company. He had been connected with the company for thirty years, and the agency had extended over the plantations of the company in Queensland since they had been established.

In connection with the price of sugar he had classified the sugars into three sorts—whites, yellows, and rations. The prices from 1882 to 1889 had ranged as under:—

Year.	First Whites.	Second Whites.	Yellow Sugars.	Ration Sugars.
	Per ton.	Per ton.	Per ton.	Per ton.
1882	£36 to £28	£28 to £23	£24 to £20	£22 to £16
1883	£34 to £28	£27 to £25	£27 to £19	£17 to £14
1884	£30 to £20	£26 to £18	£24 to £14	£13 to £10
1885	£20 to £18	£19 to £17	£17 to £13	£10
1886	£20	£19	£14 to £11	£11 to £10
1887	£26 to £27	£25 to £14 10s.	£15 to £11	£12 to £9
1888	£22 to £18	£19 to £16	£17 to £13	£12 to £10
1889	£26	£24	£21	£13 to £14

Plate 135.—Hauling Cane, Babinda, North Queensland.

Mr. Forrest went on to say—

"Over-production, largely due to the production of beet sugar, which had affected the Australian market in the same way as all other markets, accounts for the above fluctuation in prices. In 1887 the estimated Queensland production was 57,960 tons, of which 41,890 were exported, leaving for local consumption 16,070 tons. The price of sugar was fixed by that at which it could be imported from other places. The Melbourne and Sydney prices ruled the market. Queensland benefited to the extent of £2 to £3 per ton on sugar sold locally. Agent charges were 6¼ per cent. That covered commission, *del credere,* receiving, storing, delivering and insurance—everything except freight, wharfage, and interest. Both insurance and freights were high; insurance rates should have been reduced long ago."

There is a gap between 1889 and 1893 which I am at present unable to fill up. The manager of the Colonial Sugar Refining Company at Brisbane has kindly supplied the following table from 1893 to the present date, of the prices of refined sugar current at Brisbane. The Brisbane office of the Colonial Sugar Refining Company was opened in 1893:—

PRICE OF NO. 1A REFINED SUGAR CURRENT AT BRISBANE FROM AUGUST, 1893, TO JUNE, 1931.

	£	s.	d.		£	s.	d.
17th August, 1893 ..	18	10	0	14th August, 1897 ..	15	10	0
12th March, 1894 ..	18	10	0	1st July, 1898	14	10	0
16th July, 1894	18	0	0	7th December, 1898 ..	14	10	0
19th October, 1894 ..	17	10	0	13th December, 1899 ..	15	0	0
6th December, 1894 ..	16	10	0	24th January, 1900 ..	15	10	0
19th February. 1896 ..	17	10	0	22nd March, 1900 ..	16	10	0
11th July, 1896	16	10	0	10th May, 1900	17	10	0
26th September, 1896 ..	16	0	0	22nd August, 1900 ..	16	0	0
9th February, 1897 ..	17	0	0	23rd November, 1900 ..	16	0	0
21st June, 1897	17	0	0				

FEDERAL TARIFF ON SUGAR IMPOSED 8TH OCTOBER, 1901.

	£	s.	d.		£	s.	d.
9th October, 1901 ..	21	5	0	11th November, 1904 ..	20	17	6
24th October, 1901 ..	21	5	0	2nd December, 1904 ..	21	7	6
8th November, 1901 ..	20	15	0	6th January, 1905 ..	22	7	6
1st July, 1902	19	15	0	26th January, 1905 ..	23	7	6
8th October, 1902 ..	19	5	0	23rd May, 1905	22	7	6
17th November, 1902 ..	19	15	0	13th July, 1905	21	7	6
9th December, 1902 ..	20	5	0	2nd November, 1905 ..	20	17	6
7th February, 1903 ..	20	10	0	19th May, 1906	20	17	6
21st October, 1903 ..	20	0	0	3rd July, 1906	19	17	6
30th June, 1904	19	12	6	30th August, 1906 ..	19	7	6
20th September, 1904 ..	20	7	6	20th June, 1907	19	12	6

EXCISE ON SUGAR WAS RAISED TO £4 PER TON ON THE 1907 CROP.

	£	s.	d.		£	s.	d.
9th August, 1907 ..	19	12	6	1st October, 1910 ..	21	15	0
17th October, 1907 ..	19	12	6	13th October, 1910 ..	20	15	0
20th March, 1908 ..	20	2	6	31st October, 1910 ..	20	5	0
16th April, 1908	20	12	6	28th July, 1911	21	5	0
13th May, 1909	20	17	6	11th August, 1911 ..	22	5	0
2nd October, 1909 ..	21	2	6	1st September, 1911 ..	23	5	0
19th November, 1909 ..	21	10	0	3rd November, 1911 ..	23	15	0
5th January, 1910 ..	21	15	0	31st August, 1912 ..	23	5	0
25th February, 1910 ..	22	5	0	5th October, 1912 ..	22	5	0
8th March, 1910 ..	22	15	0				

Excise and Bounty, abolished 25th July, 1913.

	£ s. d.		£ s. d.
25th July, 1913	21 15 0	26th March, 1920	49 0 0
2nd July, 1914	21 5 0	27th May, 1920	49 0 0
6th July, 1914	20 15 0	1st October, 1921	49 0 0
24th October, 1914	22 0 0	1st November, 1922	42 0 0
18th February, 1915	23 0 0	22nd October, 1923	37 11 4
20th July, 1915	25 10 0	1st September, 1925	37 6 8
17th January, 1916	29 5 0	2nd July, 1928	37 6 8
18th November, 1918	29 5 0		

The latter price is still current.

The above prices refer to refined sugar. Regarding the price of raw sugar I am unable to go further back than 1895. Prior to that, most of the mills turned out a white sugar direct for the market. According to the late Mr. John Drysdale, the average price received for raw sugar from 1895 to 1900 was £9 16s. 4d. per ton.

Commencing with 1901 the prices of raw sugars were close to the following figures. From 1901 to 1904, the payment was for raw sugar of 88 net titre; from 1904 on the net titre was 94. Prices for raw sugar varied a little in the earlier years according to the quality of the raws:—

Raw Sugar Prices, Queensland, 1901 to 1930.

Year.	£ s. d.	Year.	£ s. d.
1901	10 19 0	†1916	18 0 0
1902	11 2 10	1917	21 0 0
1903	11 3 3	1918	21 0 0
1904	12 10 11	1919	21 0 0
1905	12 2 8	1920	30 6 8
1906	10 14 8	1921	30 6 8
1907	10 9 0	1922	30 6 8
1908	11 3 5	1923	27 0 0
1909	12 2 6	1924	26 0 0
1910	11 7 7	1925	19 10 7
1911	13 8 6	1926	24 10 10
1912	12 17 2	1927	22 0 4
*1913	15 17 6	1928	20 17 11
1914	14 15 6	1929	20 5 10
1915	18 0 0	1930	19 13 1

After the outbreak of the European War in 1914 the sugar industry passed through a critical period. This will be dealt with in the next article.

[to be continued.]

---

* The Excise and Bounty were abolished in 1913. Provision was made by "*The Sugar Growers Act of* 1913" of the Queensland Government for payment by the mills direct to the growers of what was really the old rate of bounty or rebate in the four different districts, plus the sum of 2s. 2d. The latter was assumed to be the sum returnable out of the £1 hitherto retained by the Federal Government, and was not fixed upon a sliding scale for the different sugar districts, as was the old bounty. The sums to be paid to the growers by the mills were, therefore—

	s. d.
In No. 1 district	9 8
In No. 2 district	9 2
In No. 3 district	8 8
In No. 4 district	8 2

the old rates of bounty being 7s. 6d., 7s., 6s. 6d., and 6s. respectively.

This remained in force during 1913 and 1914, and was then suspended by an Agreement between the Federal and State authorities for the payment of £18 per ton of sugar in 1915.

† Cane Prices Board commenced operations.

Bureau of Sugar Experiment Stations.

CANE GRUB—BIOLOGICAL CONTROL.

In connection with the recent cable announcing that an army of Canadian flies was speeding across Canada en route to Australia, where a battle against the sugar-cane grub on the plantations of Queensland would be staged, the Director of Sugar Experiment Stations (Mr. H. T. Easterby) has made the following statement:—

Some time ago the entomologist at the Bundaberg Sugar Experiment Station (Mr. R. W. Mungomery) applied for permission from the Federal Government to import a shipment of 500 white grubs parasitised by a fly known as *Microphthalma michiganensis.* These arrived last year and were imported in the hope that they might prove a factor in bringing under more effective biological control one or more of the most important scarabæids, namely—*Pseudoholophylla furfuracea, Lepidiota trichosterna,* and *Lepidiota frenchi.* Unfortunately, the mortality in this importation was high; only about 20 per cent. of the parasitised grubs surviving the journey, so that there were not sufficient to secure mating and subsequent larviposition, and the colony died out. This year it was determined to import a much larger quantity, with the help of the Canadian Government Entomologists.

The principle of controlling an insect pest by means of its insect enemies has worked with wonderful success in the Hawaiian Islands, where most of the previously important crop pests have been relegated to inferior positions. In Hawaii and California, where most of the pioneering work in biological control was carried out, success after success has followed these earliest parasite importations, and this has tended to popularise this form of control. More recently in Fiji, the Levuana moth, which, in 1925, threatened with extinction the coconut plantations there, has now been controlled in a most spectacular manner by a parasite introduced from the Federated Malay States.

In Southern Queensland, the cane grub has for many years been the most important pest of sugar-cane, and in some districts still requires certain control measures to be regularly instituted against it. The most important means of overcoming this pest is by a system of hand-picking the grubs and by soil fumigation. With the object of eliminating these tedious operations, and placing the pest under a more effective and satisfactory control, these Tachinid flies are being imported into Queensland from Canada. These flies in their native country attack root-eating grubs very closely related to our species, and it is considered likely that they will establish themselves on our species, in which case the cane grub may be reduced to the status of a minor pest. Whether, however, the fly will parasitise the Queensland species or not, will only be determined by actual experiment. Under these circumstances, therefore, it is unwise, at this juncture, to attach too much importance to the importation of these Canadian fly parasites, as there can be no guarantee that the insects will prove successful. Various factors such as the alteration of seasons from the Northern to the Southern hemispheres, the substitution of a new insect host, &c., have to be overcome, and finally, climatic conditions will largely govern the question of whether or not the parasite is likely to succeed. On this account, it cannot be emphasised too greatly, that there should be no cessation of control measures which have been carried on against the grub pest up to the present, until the success of an introduced parasite has been assured.

THE LARGER HORNED CITRUS BUG

(*Biprorulus bibax* Breddin).

By W. A. T. SUMMERVILLE, B.Sc., Entomological Branch.

THE Larger Horned Citrus Bug has been known to entomologists of this State (as a citrus-feeding insect) for more than forty years, but until about five years ago it was regarded as being of only minor importance from the economic point of view.

At various times during the last ten or more years, it has been reported as causing rather severe losses of fruit, but from the records it appears that the earlier outbreaks in pest proportions occurred in isolated cases, were of short duration and were infrequent. The only point of much interest gathered from these records is that the damage seems to have taken place at times when the particular locality affected was suffering from the effects of dry weather.

Thus very little attention was paid to the insect almost to the time when the investigation now recorded was commenced in 1929. This investigation was undertaken at that time following representations made by citrus growers in the Gayndah district. From evidence now gathered it appears, that with the development of the citrus-growing industry in districts, such as Gayndah, further removed from the coast than the main centres of citriculture had been situated previously, the insect has asserted itself more and more each year, until now it is undoubtedly the worst pest of citrus in these drier localities. At the same time there is very little doubt that for many years the insect has been responsible for heavy losses of fruit on individual orchards, both near and remote from the coast.

That it has become so important a pest, before attention was paid to it, in spite of these heavy losses, is due mainly to the fact that until recently it has not been possible to have an officer of the Entomological Branch keeping in constant touch with the general pest position of citrus, and that growers in general did not recognise the real cause of their losses and thus did not direct attention to it. The dropping of the fruit for which the bug was almost certainly responsible was, for the most part, attributed to climatic influences, and many growers were satisfied, apparently, that the loss was inevitable under the conditions in which they had to grow the trees at that time. The reason for this failure to identify the true cause of the falling of the fruit will be more apparent later, and it will be seen that this is by no means as unreasonable as might at first appear.

Of course there were some growers who knew, or at least suspected, that the bug was the agent of destruction; but, as has been stated, it is only comparatively recently that attention has been directed to the pest.

Synonomy.

The first reference to the insect was made by Tryon who, in 1889, described the adult fully, but did not give it any specific name. This reference appears in Tryon's "Report on Insect and Fungus Pests, No. 1" and the insect is there designated *Rhynchocoris* sp.

Ten years later W. W. Froggatt, following Tryon's name, referred to the bug in his "Insect and Fungus Diseases of Fruit Trees."

In the following year Breddin described the insect and named it *Biprorulus bibax* (Ent. Nachr, XXVI. 30, 1900).

In 1905, E. P. Van Duzee gave a very good description of the species, in the "Bulletin of the American Museum of Natural History" (Volume XXI.), in connection with his notes on Australian Pentatomidæ. However, in that work the generic name was wrongly given as *Birorulus*, an error which has since been repeated by other writers, but which was definitely corrected by G. W. Kirkaldy in the "Catalogue of the Hemiptera (Heteroptera) Volume I."

It may be noted in connection with Van Duzee's description mentioned above that, though very good in all other particulars, this is not accurate as regards colours, no doubt owing to the description having been made from old museum specimens.

Vernacular Name.

The vernacular name now proposed is admittedly rather cumbersome, but owing to the occurrence of a number of other somewhat similar insects on the same host plant, it is necessary to adopt a name which will distinguish it from these.

The older names—Green bug and Spiny Orange bug—have been discarded as unsuitable for the following reasons:—

(1) There are three green-coloured bugs commonly found on citrus in this State.

(2) Two of these green species are "spiny."

(3) *Biprorulus bibax* markedly prefers both lemons and mandarins to oranges.

To ensure then that growers will be able to definitely distinguish this bug from other similar ones feeding on the same host, it is necessary to use the somewhat long title of Larger Horned Citrus Bug.

Distribution.

From the available records this appears to be the only known species of the genus *Biprorulus*. It is confined to Australia.

W. W. Froggatt has recorded it from Gosford and other parts of the Hawkesbury River district, Moree, Coonamble, and Garah in New South Wales. In the collection of the Queensland Department of Agriculture and Stock there are specimens from many parts of the State, and it is known to occur as far north as Charters Towers and as far west as Roma in the southern portion of the State, and Barcaldine in the Central West. Probably it extends further west still.

The known distribution then is between latitudes 20 deg. S. and 34 deg. S. and from the coast west to longitude 145 deg.

Economic Importance.

As has been stated *B. bibax* has only recently come to be regarded as a major pest of citrus, and though it has probably been causing severe losses in more or less isolated cases for more than ten years, the amount of damage done has apparently grown with the development of the citrus industry, especially in places where the annual rainfall is 30 inches or less. For the most part these localities are situated more than 80 miles from the coast, but in others, such as the Rockhampton

and Caboolture districts, which are very near the ocean, the topography of the surrounding country apparently exerts sufficient influence to compensate for the geographical position. Possibly in and near the tropics the proximity of the coast matters less.

In other districts such as the Howard-Burrum area and on the Blackall Range, the occurrence of the insect in pest numbers is more or less spasmodic and usually happens on individual orchards or more generally in very dry times.

In assessing the importance of the pest it has to be remembered that the heaviest damage, and this is very considerable, is perpetrated in those districts in which the expansion of the citrus-producing industry of the State can be expected most confidently.

The lemon is the most heavily attacked species of citrus, and it is possible that the production of that fruit will become more and more important in those districts in which the bug operates most extensively.

Further, the class of fruit produced in these drier areas is for the most part very well fitted for export and is thus again of added importance.

In those districts near the coast, where the pest is less frequently troublesome, it has to be borne in mind that the losses for the most part occur in the very dry seasons, and, therefore, at a time when growers can, for the most part, least afford to suffer loss.

As regards the actual amount of damage which is occasioned, this varies, not only with the district, but even when the infestations on the same orchards are comparable in different years the loss seems to vary in quantity.

Losses of up to 90 per cent. of lemons have been experienced, but with moderate infestations 40 per cent. is the average.

Losses of 33 per cent. of all attacked varieties have been known in quite a number of cases, but for an average orchard in which handpicking is practised fairly systematically 15 per cent. to 20 per cent. would, it is thought, be about the normal.

Unchecked, of course, there is almost no limit to the injury the pest will do, and in spite of diligent daily handpicking instances of approximately 30 per cent. loss have been noted.

Economic Host Plants and Varietal Preference.

The Larger Horned Citrus Bug has not been found to feed on any economic plant other than citrus. As far as citrus is concerned it attacks every variety grown commercially in the State. However, marked preference for certain varieties over others is evidenced.

The exact order of preference is not at all clearly defined in respect to the first two or three places, and in the course of observations on this point a number of apparently conflicting facts were noted.

In the great majority of cases the lemons are most heavily attacked. On the other hand on other orchards the Beauty of Glen Retreat mandarins are much more favoured than the lemons or any other variety. This preference for Glen Retreat over all other varieties of mandarins has been observed in a large number of cases. At times, however, the Emperor of Canton mandarin suffers more severe attack

than the Glens, whilst in a limited number of cases Fewtrell Early mandarins are more favoured than Emperors growing close to them.

Often it will be found that the bug will concentrate on one or other of these three varieties to the exclusion of all others.

Experiments have been carried out with a view to ascertaining the order of preference. The apparatus was very crude consisting essentially of three well-made boxes joined together by tubes of celluloid 3 feet long. An equal amount of light was arranged for each of the three boxes and the whole placed in such a position that draughts were reduced to a minimum. Adult bugs were placed in the centre box and fruits of different varieties in each of the others. Each experiment was repeated six times, the positions of the varieties being changed from end to end at the commencement of each trial.

It was found that lemons and Glen Retreats gave satisfactorily consistent results of attracting the insects away from all other tested varieties. Fewtrell Early showed very little capacity for attracting the insects.

The tests of the relative attractiveness of lemons and Glens were not satisfactory.

It was indicated that when both fruit were fresh the bug appeared to be well satisfied with either. When the mandarins were picked for some days before being supplied, the bugs for the most part preferred the lemons. The age of the lemons, however, did not appear to be material. These results were merely indicated and not definite. Consistent results could not be obtained.

The condition of the tree as regards quantity, and to a less extent quality of fruit, and more particularly as regards amount of foliage exerts a good deal of influence. The state of the fruit as regards maturity also is of importance, but none of these points explain the apparently inconsistent facts recorded above in connection with field observations.

Probably the most important factor, and one which has sometimes been fairly conclusively shown to account for apparent varietal preference, is the position of the other varieties relative to the lemon trees. The absolute position of some trees is also of account in determining just which variety will be most heavily attacked. This statement will be elaborated in the discussion on migration.

On all the evidence which has been gathered, it may be safely assumed that for all practical purposes the order of varietal preference may be stated as follows:—

1. Lemons. No preference with respect to commercial varieties, but the rough skin or bush lemon, as it is termed, is at times more heavily attacked than lemons of other varieties growing nearby in the same orchard. The loss of Villa Franca fruit is probably heavier than is the case with Lisbons owing to the fact that the former carries fruit rather more consistently throughout the year than the latter. 2. Beauty of Glen Retreat mandarins. 3. Emperor of Canton mandarins. 4. Fewtrell Early mandarins. 5. Scarlet mandarins. 6. Late Valencia oranges. 7. King of Siam mandarins. 8. Naval oranges. 9. Other varieties.

The Kumquat is also very palatable to the bug, but these trees are rarely grown commercially and the number to be found is comparatively small.

Fig. 1.

Fig. 2.

Plate 136.

Fig. 1.—Small tree of Native Kumquat.

Fig. 2.—Small trees of Native Kumquat in foreground.

Other Host Plants.

In addition to the cultivated varieties of citrus *B. bibax* feeds and breeds on the indigenous plant *Eremocitrus glauca*—the native kumquat, or desert lime, as it is sometimes called. This plant grows in large quantities in the drier areas of the State and also in New South Wales. It is usually to be found in fairly open country and frequently occurs as an undergrowth in Iron Bark or Box formations.

W. W. Froggatt first recorded the insect from this host in New South Wales, but for a long time, in spite of diligent search by several officers of the Queensland Department of Agriculture and Stock, the bug was not found on the native kumquat in this State. However, it was finally found in large numbers on trees which had previously been examined. The trees were fruiting when the insects were found, whereas on each of the three previous occasions no fruit was seen. Since then the bug has been found on this plant, when in fruit, in several localities.

At Roma, where there are many acres of the native kumquat, the bug has been taken in the summer months on it. The plants were then carrying fruit. Exhaustive examination of the same plants in the winter was made, but not a single bug was found. In the following summer these plants again harboured the bug.

It would thus appear that *B. bibax* spends only a portion of the year on *E. glauca*. That means that there must be another host to which the insect migrates, at least during the winter months or possibly during most of the time the native kumquat is without fruit.

This other host cannot be represented by the orchard trees for in that case the migration would not be so complete, and further, as the insect is an indigenous one, this other host would appear to be necessarily an indigenous plant.

Again there is no evidence that the bugs migrate into the orchards between April and September. Indeed, the number of bugs found in the orchards during this intervening period is surprisingly small.

The native kumquat, as has been stated, grows for the most part on open country, and in general in the places in which it has been found, during these investigations, would certainly experience a fairly severe winter.

From the known fact that the insect generally thrives best in a hot, dry climate, it is reasonable to suppose that by passing the winter on the native kumquat it would be subject to very uncongenial conditions.

In addition to the native kumquat *B. bibax* has also been found on the finger lime—*Citrus australasica*. The bugs, in the adult stage only, were found on this plant in fairly large numbers during October. It may, therefore, be that this plant is the alternative host.

That would mean that the bugs habitually migrate from *E. glauca* to *C. australasica* at the beginning of the winter, and then return to the first-named plant with the advent of the warmer weather. This migration would coincide more or less with the periods of fruit bearing of each of the species.

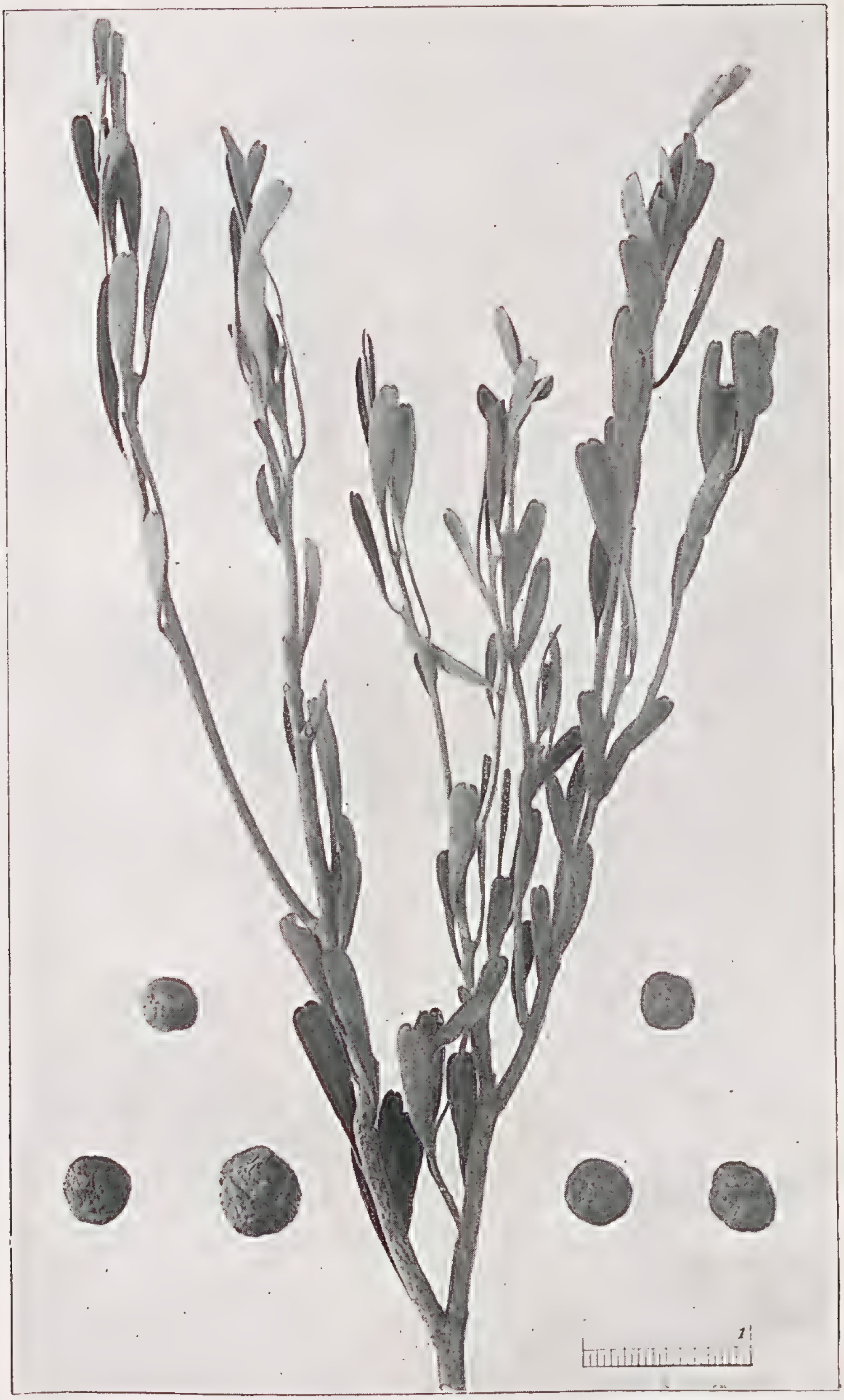


PLATE 137.
Leaves and fruit of Native Kumquat. The fruit is often much larger than these illustrated.

C. australasica is confined to the heavy coastal scrubs such as are found on Tamborine Mountain and the Blackall Range. There is another indigenous species of citrus (*C. australis*) which is found somewhat further inland than the finger lime, and it is probable that *B. bibax* also feeds on this.

If either *C. australis* or *C. australasica* is actually the alternative host plant to *E. glauca*, it would mean that bugs for the greater part would have to travel very long distances between reasonably large supplies of food plants. The distance, however, is by no means so great as to preclude this possibility, and this may easily be the true explanation.

There is, however, the further possibility that there is still another host plant which grows further inland than *C. australis.*

It would be expected that this alternative host is a Rutaceous or allied plant, which probably grows in a closer formation forest or scrub where the bug would be able to spend the colder months less exposed to the rigours of the weather than if it were to remain on the kumquat.

Some time has been spent searching for this additional host, but so far it has not been found.

Descriptions.

The following descriptions are essentially rather technically worded. This is necessary in order to avoid undue length. However, if these descriptions are read in conjunction with the plates prepared by Mr. Helmsing, there should be little difficulty in identifying any of the stages of the insect.

In connection with the notes on colour it may be pointed out that, though there are many variations to the rule, it appears that, on the whole, bugs developing during the cooler times are rather darker in tone than those maturing in the warmer months. Further, it has been noted that mid-summer bugs are lighter in colour than those to be found either just earlier or slightly later. These remarks, of course, refer to depth of colour only and not to actual colours.

The bugs selected for Mr. Helmsing to work from were late-summer ones and were about average specimens.

Plate 139 (Figs. 1, 2).—Egg.

Diameter, 1 mm.

Almost globular, but slightly higher than wide. Glistening white (pearly). Surface covered with extremely fine punctations irregular in placings. Rim of operculum fringed with about twenty minute capitate hairs (chorionic processes).

Plate 138 (Fig. 2).—First Instar.

Length, 1.5 – 2 mm. Almost as broad as long.

Practically oval evenly rounded posteriorly and rather pointed at head. Convex dorsally and abdomen biconcave ventrally. Abdomen dorsally orange, except first segment, which is practically colourless. On venter, abdomen is pale green, becoming orange towards the margins. Sides of abdomen black on both surfaces. Dorsal surface of abdomen marked with five black transverse stripes; anterior one narrow, second wide, third widest, while the fourth and fifth are very small and in some cases merely dots. Head and thorax black, except median region of thorax ventrally which is pale green. Legs long, brown in colour. The tibiæ and tarsi with short light-brown hairs. Antennæ brown to almost black, except bases of ultimate and penultimate joints, which are orange in most cases. Rostrum short and stout reaching to third abdomenal segment, pale green in colour.

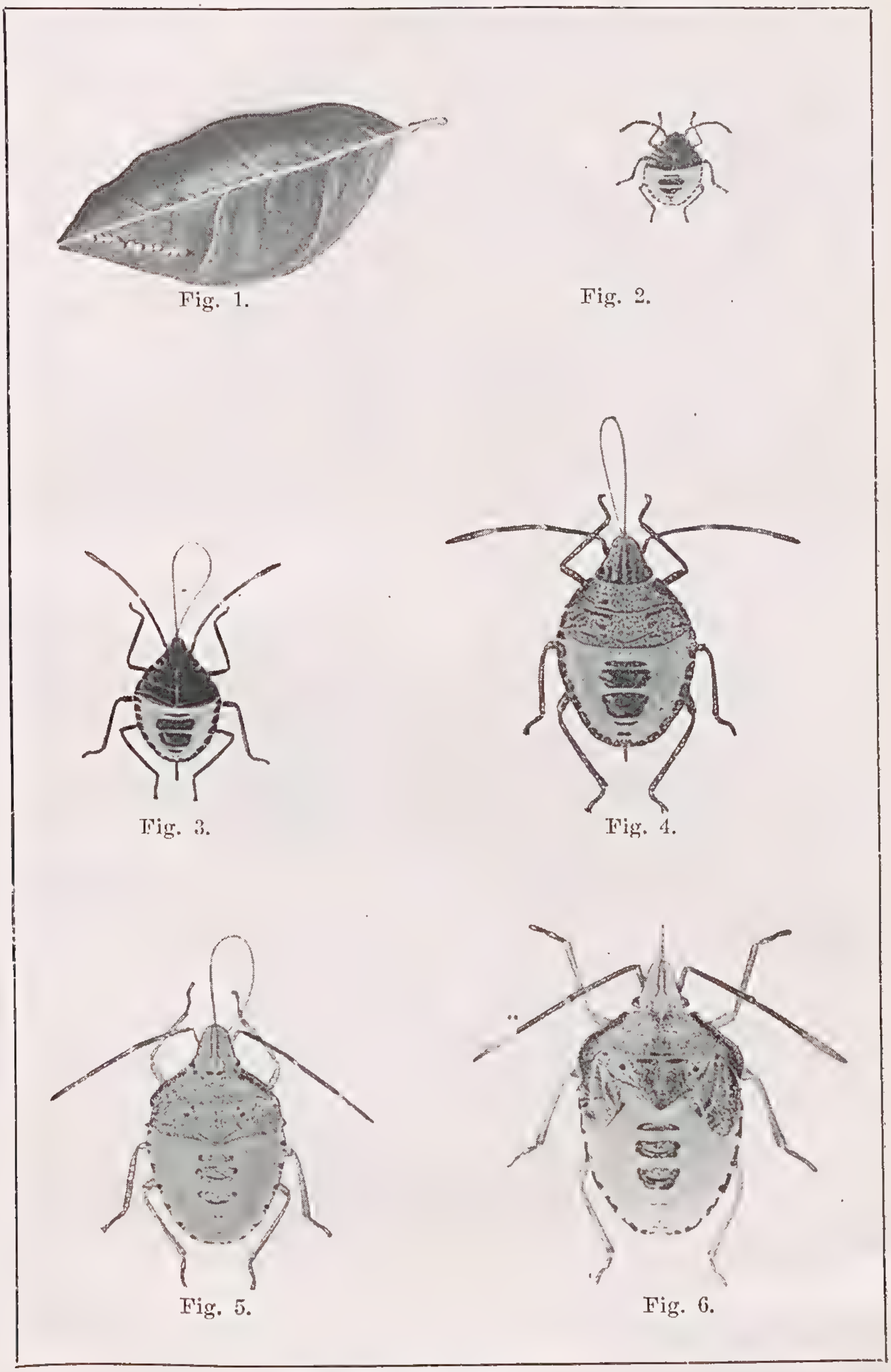


Plate 138.

The Larger Horned Citrus Bug (*Biprorulus bibax* Breddin).

Fig. 1.—Eggs on leaf; half natural size; Fig. 2.—First instar × 4; Fig. 3.—Second instar × 4; Fig. 4.—Third instar × 4; Fig. 5.—Fourth instar × 3; Fig. 6.—Fifth instar × 3.

—*From a water-colour drawing by I. W. Helmsing.*

Plate 138 (Fig. 3).—Second Instar.

Length, 4 – 5 mm. Breadth, 3 – 4 mm.

General shape and colouration as in first instar, but ventral surface of head and abdomen becoming pale green. Coxæ and trochanters pale green. Rostrum almost 1 mm. longer than body and held projecting beyond the end of the abdomen. The rostrum is also pale green, and the stylet is invariably held half exerted and erect in front of the head. It is brown and very conspicuous as carried. Antennæ dark brown, except the extreme base of penultimate and basal half to one-third of ultimate joints which are orange. Femora sparsely and tibiæ and tarsi hirsute. The transverse lines on abdomen are as in stage I., except that the second and third are broader and the fifth smaller than in that stage.

Plate 138 (Fig. 4).—Third Instar.

Length, 7 – 9 mm. Breadth, 4 – 6 mm.

In this stage there is a great amount of variation in the colours of different individuals. There does not appear to be any connection between the colouration and the subsequent development of the individual. Though usually the insects are assignable to a light or a dark variety, there are often many intermediate forms. Generally speaking, it has been noted that the lighter individuals are larger than the darker.

In both varieties the venter is pale green, except at the margins which are black. The ground colour of the dorsum is also green. The five black transverse lines are still represented. The anterior three are more pronounced than in the preceding stages, while the posterior two are less conspicuous or even absent. The second and third are now much wider than formerly, and are really a series of spots and blotches rather than a simple line as previously. Antennæ dark brown to black, except the base of the ultimate joint which is yellow. Thoracic margins are now flattened to form a narrow flange which varies from mottled green to black. In the median region of the head are two parallel lines which are brown to black and run the length of the head, traversing grooves from the base of the proboscis for about two-thirds their length. In the darkest individuals these lines are not distinguishable as such. Rostrum reaching at least to base of abdomen and usually projecting beyond the extremity. Stylet carried as in stage II.

The colouration of the remaining parts in light specimens is as follows:—Head and thorax light green, lightly mottled with black; the black being confined to irregularly placed punctations. Yellow portion of the antennæ very conspicuous. Coxæ trochanters and femora light green; tibiæ and tarsi brown.

Dark specimens differ in that the mottling of the head and thorax is much more pronounced and in extreme cases, which are common, the whole head and thorax is uniformally black and shining. On the abdomen the dark portions are again more prouounced and the femora are green at the base only, the remainder being dark brown to black.

Plate 138 (Fig. 5).—Fourth Instar.

Length, 9.5 – 11 mm. Breadth, 6 – 6.75 mm.

Dorsum.—Pale green. Head and thorax mottled with black; abdomen less thickly so. The degree of mottling varies, some individuals appearing uniformally green, while in others the head and thorax appear quite black. On the abdomen the dots are arranged more or less in transverse lines, elsewhere the placing is less regular. The black is practically confined to punctations. The thorax is mottled more heavily towards the margins. There is a black spot on each side of the mesothorax one-third way from the median line towards the anterior, and usually another such spot on the posterior edge of the metathorax. The longtitudinal lines of the head conspicuous. Antennæ with basal joint green suffused with brown, remainder brown, except the basal half of last joint which is orange, sometimes with a small green area.

The lateral margins are brown to black, narrow on head, wider on thorax, and very variable on abdomen. Here it may be merely a line on the margin widening to a spot at the posterior angle, or it may be widened out at both angles or evenly wide over the whole length. Other abdominal markings are also variable. At least there are four black spots, more often six, forming a square or rectangle. The posterior four mark the position of glandular openings from which a secretion is emitted. The area about these glands is somewhat elevated. In darker specimens these areas are so thickly mottled as to appear quite black.

Venter.—Lighter green than dorsum, with lateral edges brown to black. The green is very lightly mottled with black. The lateral band varies as on dorsum. Proboscis light green, with tip black and reaching almost to tip of abdomen. Stylet

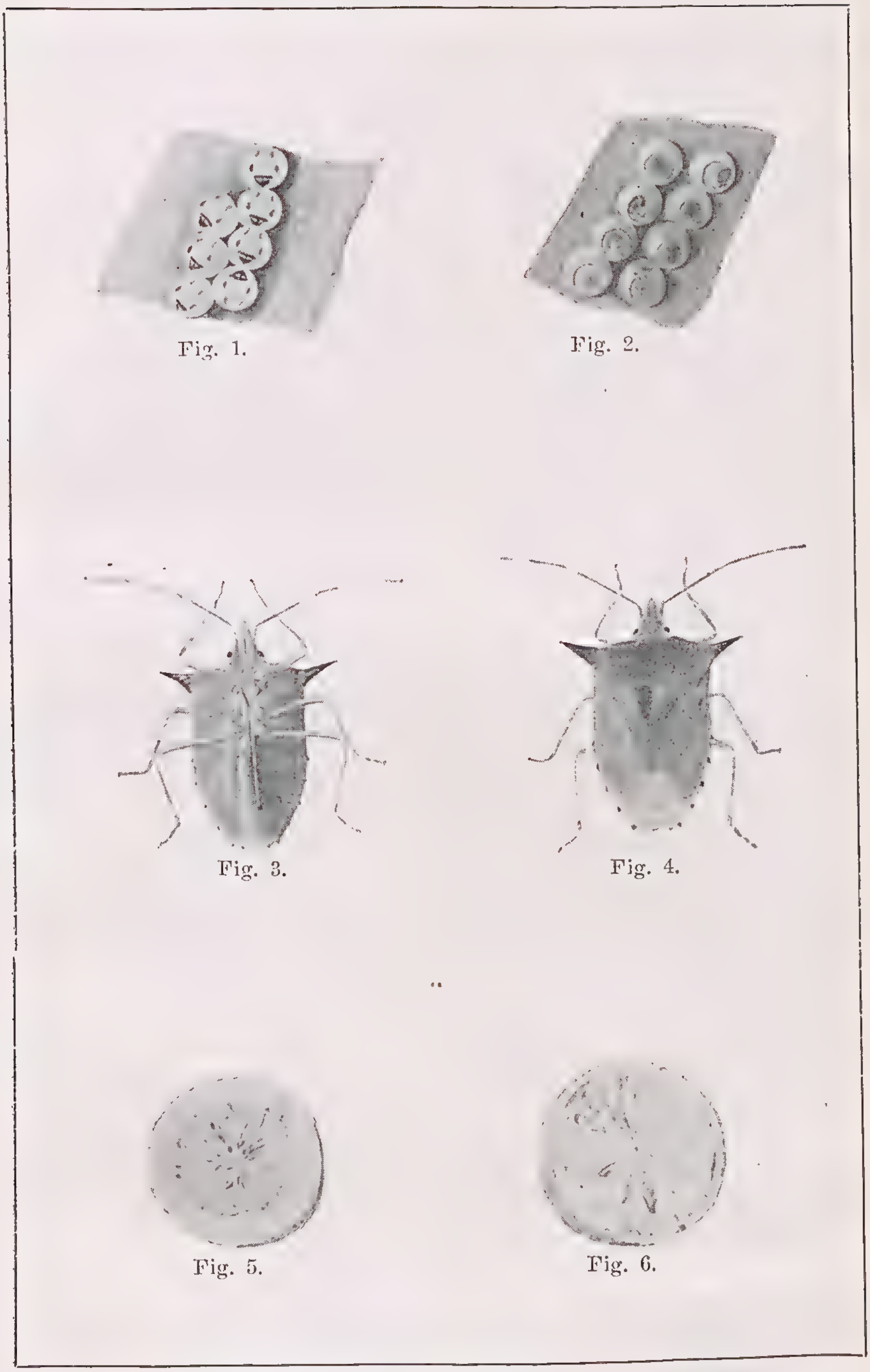


Plate 139.

The Larger Horned Citrus Bug (*Biprorulus bibax* Breddin).

Fig. 1—Eggs about to hatch × 4½; Fig. 2—Eggs parasitised × 4½; Fig. 3—Adult ventral view × 1½; Fig. 4—Adult dorsal view × 1½; Fig. 5—Orange showing damage, one-half natural size; Fig. 6—Lemon showing damage, one-half natural size.

—*From a water-colour drawing by I. W. Helmsing.*

brown, held partly exerted. Tibiæ green suffused with brown, tarsi with first joint green to brown, second joint brown, remainder of legs green. Femora sparsely tibiæ and tarsi rather thickly hispid.

PLATE 138 (Fig. 6).—FIFTH INSTAR.

Length, 13 – 16 mm. Breadth, 8.5 – 9.5 mm.

Dorsum.—Green mottled with black dots, the black again confined to depressions which are larger on the thorax than on the head and abdomen. The punctations at times confluent and on abdomen are arranged more or less in lines. The entire lateral margins of the sclerites black; this black portion widening out, at least at the angles, but sometimes uniformally wide for whole length of abdomen. Eyes dark-brown with a narrow band of very pale green: ocelli marked by red spots. Proboscis light green with tip black; stylet brown held as in stage IV. Head with black dots on posterior margin close to median. Antennæ brownish black to black, except the basal half of ultimate and penultimate joints which are orange. Sometimes the whole of ultimate joint yellowed; last three joints pubescent. Prothorax with the flange black, sometimes with a light green stripe towards the margin. Scutellum with five black spots, four on the anterior margin and one on the apex. This last spot sometimes absent. In addition, on the scutellum there is often a faint black transverse line on each side near the anterior margin. Wing pads well developed; generally thickly mottled with black towards the tips. Pronotum somewhat expanded sideways, but not wider than the greatest width of the abdomen. The three raised areas about glands conspicuous with black lines, or in lighter specimens black lines represented by about six spots.

Venter.—Lighter green than dorsum. Abdomen usually with very fine brown spots. Legs green becoming darker towards the tarsi, which are shining brown to black. Femora, tibiæ and tarsi hispid; in darker individuals the tibiæ may be dark brown also.

PLATE 139 Fig. 4).—ADULT.

Length, 14.4 – 22 mm. Breadth, 12 – 16.5 mm.

Elongate oval. General colour shining lemon-green, somewhat lighter on the venter than dorsum. Head elongate slightly tapering to front, punctate above, somewhat striate transversally beneath. Eyes black with a posterior band of very pale green. Ocelli brown set close behind the eyes. Antennæ green, last four joints pubescent, ultimate joint rather more lightly so than rest. First joint shorter than head, second longer than first; third joint about twice the length of second and about equal to fourth; fifth a little more than half the length of fourth.

Pronotum strongly declined anteriorly, deeply emarginate. Pronotal angles strongly produced at sides forming stout very sharp spines. These spines appear black, but actually are black in front and at tips, but blue behind. Scutellum triangular with sides curved inwards, bluntly rounded posteriorly more than half as long as abdomen. Pronotum and scutellum coarsely and closely rugose, except for a smooth area on each side near anterior margin of pronotum occupying half to two-thirds total width.

Forewings extending a little beyond end of abdomen; corium less coarsely punctate than scutellum.

Posterior angles of each abdomen segment black produced in small sharp spines.

Rostrum green with black tip; in full fed specimens not extending beyond the fourth abdominal segment.

Carina extending to base of head, deep, split at posterior end. Ventral spine short and stout received into split in the carina.

Spiracles conspicuous very pale green.

Ostiole prominent. Ostiolar canal evanescent.

Prosternum coarsely and venteral surface of abdomen finely punctate.

Meso and metasternum with ill-defined striæ.

Femora tibiæ and tarsi pubescent; tarsi brown, rest of legs green.

Sex Differences.—Apart from primary sex differences which are clearly marked the following secondary sex characters may be noted:—

As a rule the female is larger than the male. The abdominal spines of the last segment of the female are strongly developed and sharply pointed, while in the male these are scarcely produced into spines but are rounded and set wider apart than in the female. The posterior margin of the last segment in the male is clothed with fairly stout hairs, while in the female the hairs are less numerous and confined to the area around the spines.

Proportion of Sexes.

Counts of large numbers of adults were made in various localities at each season of the year, and it was found in every case that males and females were present in about equal numbers.

In the laboratory it was noted that in general the male was rather shorter lived than the other sex.

As regards the hatching from individual batches of eggs, no constancy in proportion of sexes was found—sometimes one sex being in the majority and at other times the sexes were about equally represented.

Allied Citrus Insects.

Of the five bugs which are commonly found feeding on citrus in Queensland there is some superficial resemblance between the three green species—*Biprorulus bibax, Vitellus antemna* Breddin, and *Lyramorpha rosea.* Westw. Of these three the last-mentioned may be easily recognised by its large size, and more particularly by the "swallow tail" appearance. This species is, moreover, without any semblance of spines on the thorax.

The resemblance of the other two green species is much stronger, but *B. bibax* is larger, has more pronounced spines, and is devoid of the reddish markings which adorn the smaller insect. The immature stages of these two are somewhat similar but the sizes are again different.

The remaining two citrus-feeding bugs are so different from the Larger Horned one that confusion is very unlikely. One of these is bronze to black in colour and much larger, while the other is quite different in shape and is bluish-black with red markings on the legs and under surface.

Habits and Characteristics.

The eggs are to be found on all aerial portions of the tree except floral parts. Under natural conditions they have not been observed on any plant other than the now recorded hosts, as is often the case with the Bronze bug. The most favoured positions are the fruit and the leaves. The most frequently used site of all is on the upper surface of the leaves close to the mid rib. The eggs are affixed to the plant by a sticky secretion which covers them as described in the discussion on oviposition. They are deposited in batches of various groupings. The most commonly found grouping is two parallel rows of equal or nearly equal length. Single rows and a V-shaped arrangement are also frequently met with, while double-ended rows or irregular placings are also found.

When two eggs are laid together they touch each other, and when more than two are grouped they are usually touching one another on all possible sides.

As regards the numbers of eggs to be found in the batches, these vary considerably and the following counts of apparently normally laid batches were made in one orchard on the same day:—25, 24, 17, 28, 27, 30, 19, 16, 22, 24, 30, 28, 10, 15, 18, and 27.

As low as two or even one may sometimes be seen, but less than six is not common and it is probable that in most of these cases the female was disturbed whilst ovipositing. The greatest number of eggs found in one lot was 32.

PLATE 140.
The Larger Horned Citrus Bug (*Biprorulus bibax* Breddin).

On hatching from the eggs the young, unless molested, remain grouped together, generally close to the site of the egg shells from which they have emerged. In this stage they do not feed, their only requirement seemingly being water. In the laboratory it was found that these first instar bugs thrived best in an atmosphere kept moist, but they did not long survive, when free water was allowed to remain in the container, or in a dry atmosphere.

On moulting to the second stage the bugs usually scatter and soon begin to feed. From now on there is no inclination to congregate again whilst in the immature stages.

When the younger insects are disturbed they attempt to escape by running down the branches. When dislodged from the tree they soon begin crawling, and in by far the greatest number of instances they move directly towards the base of the tree from which they were removed. If the ground be clean they reach the base of the trunk in a surprisingly short time, but where weeds or other plants are growing they more often climb a stalk on the way. It may be mentioned that it is by no means easy to dislodge the later stage larvæ from the trees by tapping the limbs. This is due partly to their habit of running down the branches, for by so doing they get into positions in which the vibration resulting from the tapping is minimised.

With adults there is a certain amount of congregating. Generally speaking, the mature bugs are found in pairs—i.e., a male and a female—but frequently three or four bugs are closely associated, sometimes feeding on the same fruit. When three are found in a group it is usually two males and one female. As many as six adults are occasionally found on one fruit.

In the winter there is a certain amount of grouping together of the adults—sometimes clusters of a dozen or more being found in a thickly foliaged part of a tree. This is not, however, very common.

The adults are capable of flying strongly, and though no idea of how far they can fly without resting has been obtained, it has frequently been observed that bugs on the wing when followed at a sharp walking pace for over a hundred yards, have disappeared from view apparently flying as strongly as when they took off.

During the day, however, they do not fly unless molested, and even then they prefer to escape by crawling rather than by flying. This point is of importance when the question of fumigation is being considered. When on the wing they make a characteristic buzzing noise. Even on a cold winter morning, when the trees are dripping dew, they are capable of flying, though at this time their flight is sometimes more or less laboured.

Most of the flights are taken in the late afternoon after the sun has lost its strength and while there is still daylight. At this time they are to be seen flying about the orchards, generally only moving to a tree three or four removed from the one they have just left.

The insects prefer a thick, leafy tree to one of scanty foliage, and this is no doubt due to their objection to being exposed to excessive heat. Experiments were carried out with a view to determining the effect of light on the insects, and it was found that, in so far as light was concerned—i.e., white to yellowish rays—there was no reaction, either positive or negative, at any time early in the night or within

an hour of sunrise. However, it was noted that when the source of light was placed so close as to affect the insect by its heat, the bug at once crawled away far enough to avoid the high temperature.

Also it has been observed that when the sun becomes very hot the bugs either seek shelter under the twigs towards the centre of the tree or move round to the shaded side and resume feeding there.

In the winter, adults are most frequently found in the heavily foliaged trees, this probably being due to the fact that in such trees they are protected somewhat from the weather.

During the day both nymphs and adults are usually found in by far the greatest numbers on the fruits. This is no doubt partly because they are more easily seen there than when amongst the leaves. The colour of the adults particularly, and of the fourth and fifth nymphal stages, harmonise so well with that of the leaves and twigs that it is seldom possible to get an accurate idea of the number of bugs on a tree which is at all thickly foliaged. An example of how difficult it is to find the insect is provided by the following:—Three Emperor mandarin trees were examined on one occasion. These trees were moderately thickly foliaged and fifteen minutes was spent on each. Where necessary the tree was climbed. They were then fumigated and the bugs thus brought to the ground. The counts made were:—

Small tree: One bug observed, 10 more brought down by fumigation.

Medium tree: Three bugs observed, 35 more brought down by fumigation.

Large tree: Fourteen bugs observed, 62 more brought down by fumigation.

From this it can be seen that it is very difficult to find the insects in the orchard, and the failure of a large number of growers to connect the loss of their fruit with the bug can be more readily understood. The scarcity or rather apparent scarcity of the insect is very misleading. Of course, the above examination was carried out when there was very little fruit on the trees thus making the search more difficult.

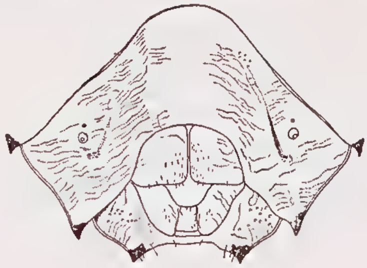
Feeding has been observed at all hours from daylight to dark but, as has been mentioned above, during some of the hottest hours in mid-summer feeding is suspended by many bugs which prefer to rest in the shade until conditions become more congenial to them. Nocturnal feeding has not been observed, but it is suspected that feeding is carried on sometimes after nightfall.

The most active times seem to be between sunrise and about 8 a.m. and between 3 p.m. and sunset. It is at these times that it is best to carry out handpicking, for the bugs are then mostly on the outside of the tree and usually on the fruit. They can thus be seen more readily and captured with greater ease.

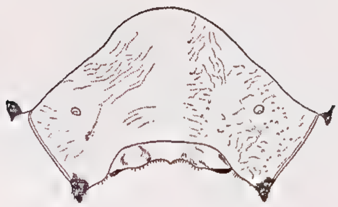
The insects prefer clean fruit to that infested by scale, but the presence of scab (*Sporotrichum citri*) does not appear to be distasteful to them.

Winter Feeding.

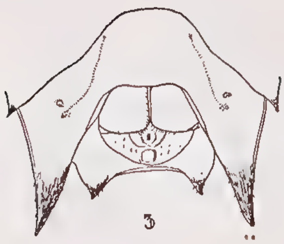
In view of the comparatively small number of bugs which are usually to be found in an orchard during the winter time, and the fact that positive proof of their feeding on citrus at that period of the year was not readily obtainable by observation, a small test was



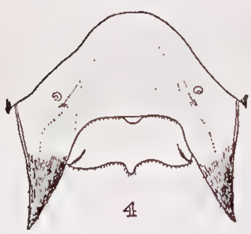
1



2



3



4

I. W. Helmsing. 1929.

PLATE 141.

Fig. 1.—Ventral view anal segment of female of *Biprorulus bibax* Breddin.
Fig. 2.—Ventral view anal segment of male of *Biprorulus bibax* Breddin.
Fig. 3.—Ventral view anal segment of female of *Vitellus antemna* Breddin.
Fig. 4.—Ventral view anal segment of male of *Vitellus antemna* Breddin.

carried out concerning this. Twenty bugs were obtained and of these ten were placed in a cage in which grass only was growing. The other ten were enclosed in a similar cage containing a citrus tree without fruit. Within twenty-four hours four of the first lot were dead and the other six very sluggish. Three of the sluggish ones were transferred to a citrus tree. These last three recovered, whilst the other three died within forty-eight hours. All the control bugs—i.e., those originally put on citrus—were alive at the end of the experiment. It would appear then that feeding takes place in the winter time to a much greater extent than might reasonably be supposed from field observations.

Secretion.

The adults, and to a lesser extent the last two larval instar bugs, are able, apparently at will, to eject an evil-smelling secretion which stains the skin a bright yellow. On softer parts severe irritation may be caused; in extreme cases burning results. If lodged in the eye it causes acute pain and has been reported to result in temporary blindness. This secretion, which is an almost colourless liquid, is ejected from glandular openings situated on the dorsum. Apparently the liquid when in quantity is very distasteful to the insects themselves, for if enclosed in a container in which free secreting is in progress the mortality is very high. For this reason great care had to be taken when transporting adults from distant orchards to the laboratory. If the adults were allowed to crawl into the container in their own time and way they could be kept crowded for a week or more without incurring a loss of more than 1 per cent. If handled at all roughly they secreted freely and the mortality was high.

The secretion is, however, not nearly so objectionable as that of the Bronze bug (*R. sulciventris*) which on the slightest provocation will squirt its fluid a distance of 2 feet or more. No such long distance has been noted in the case of *Biprorulus.*

Mating and Oviposition.

After the insects have reached the adult stage they enter upon what might be termed a period of preparation.

In the case of a female, under laboratory conditions, this preparation extends over about a fortnight. The number of observations in the case of males is rather small, but it would appear that a similar period also must elapse with this sex between the time of reaching the adult stage and the time of commencement of reproductive activity.

Copulation is in the usual manner for bugs and has been observed to extend over nearly two hours in several cases.

The preliminaries to copulation consist essentially in the male walking round about the intended mate and stroking her with his antennae when opportunity offers. These preliminaries may last for hours at a time.

In the greatest number of observed cases the female has deposited fertile eggs within forty-eight hours of copulation and often the interval was less.

The greatest number of eggs laid by any female under artificial conditions was 199. This individual was rather abnormal, and it would seem that the average is somewhere about half that number. Table III. gives the details of ten females segregated for tests of oviposition.

In one case a female laid ninety-three eggs over a period of twenty-three days. The male with which she was mated died three days after oviposition commenced and was not replaced. She continued to lay fertile eggs—only six of the last batch of twenty-two failed to hatch.

The act of oviposition is interesting. When ready to lay, the female commences movements of her abdomen which are suggestive of strain. The first egg appears in a few seconds after the beginning of the movements, and from then on eggs are expelled at intervals varying from two to five or even six minutes.

As each egg appears it is seen to be covered with a fluid. This fluid is the material by which the egg is ultimately fixed to the host plant.

When the egg has been forced from the body it is pushed into position by the hindmost leg. Usually the eggs are arranged in two parallel rows set close together. In pushing the egg into its position the female uses the hindmost leg on the side remote from the row in which the egg is to be placed. The consequent movement of her body bring her into such a position that the next egg falls where it can be readily placed in the other row. Thus the rows are generally either equal or contain only one egg more or less than the other.

It is rarely that oviposition takes place between 9 a.m. and 5 p.m. Copulation, however, has been noted at all hours of the day and has also been seen at night.

Migration.

One of the most important and at the same time one of the most difficult habits to establish as fact is that of migration from one orchard to another, or more particularly from native host to orchards.

After collection of all the seemingly relevant facts it is concluded that migration from one orchard to another is in general of no practical importance, and, further, that migration from the native host to orchards does take place and is of the greatest possible importance.

The evidence on which this conclusion has been reached is as follows:—

1. The insect has been found to live and breed on indigenous plants.

2. *E. glauca* has been found growing in most of the heavily-infested districts and, though it has not been found in others, there is reason to believe that it does grow in them. From the ecology of the plant it could be expected to thrive in such localities. It has not been found near Gayndah, but the country round that place is in great part infested with dense prickly-pear and a thorough examination of the area is scarcely possible and certainly could not be carried out in the time available. The amount of country which can be even cursorily examined in a day is negligible, and the examiner as a general rule has to go where he can and not where he may wish. *Eremocitrus glauca* extends from Roma up through the Dawson Valley and back on to the coast at Raglan, between Gladstone and Rockhampton. No doubt it extends much further west, and it also is found in New South Wales.

Further, as has been stated earlier, there is some reason for thinking that this is not the only native host plant of the bug which grows in inland localities.

3. The bug can fly strongly and habitually does so.

4. At the outset of the investigation observant orchardists frequently stated that an infestation often appeared to commence suddenly with large numbers of adult bugs. This may have been due to the fact that the damage by the adults is much more severe than that by the younger bugs, or that the adults are more easily seen than the last two instars owing to the fact that the former are larger and that they are commonly seen flying in the orchards as described above. However, this point can be considered in conjunction with the next one.

5. In early December of 1929, at the time when the eggs which represent the commencement of the early summer generation were about to be deposited, an orchard was freed of bugs by fumigation. This experimental orchard was in an isolated position and the two nearest orchards were also fumigated at about the same time. These orchards were 1 and 3 miles distant respectively from the experimental one.

Very few eggs were found and these were destroyed at once. It is certain that the number of bugs left after the fumigation was very small. Daily examination of the orchard in question was carried out, and no bugs were seen until the last few days of the year.

At this time, according to the results of the life history study, a new generation is about to commence. The owner of the orchard in the first seven days of the new infestation collected by hand over 400 adult bugs. No immature stages of the pest was seen. The following week more than 300 eggs and some 200 first-stage bugs were collected. In one day the next week 420 eggs were found, but no bug older than a second instar was seen—i.e., except adults.

6. In the winter of 1929 two orchards were freed from the pest, one at Gayndah and one at Caboolture. Both of these orchards were kept under observation and both apparently remained free from bugs until late October.

7. In another instance an entire orchard was fumigated twice at an interval of about three weeks. This was done in the summer. The trees again remained, as far as could be discovered, free from bugs until about the middle of February. Soon after this the bugs were again in evidence though the infestation was light.

From 5, 6, and 7 it will be seen that an orchard having been cleaned of the bug can be kept in that condition for a limited period only and that reinfestation may occur as soon as the individuals of the generation mainly concerned have had sufficient time to reach the adult stage—i.e., when the bugs of the dominant brood are capable of flying.

8. In many instances it was noticed that the trees on one face of an orchard became infested much earlier than the remainder, and in some of these cases the bugs did not work into the orchard to any extent. This was soon shown to be independent of varietal preference.

In the case of the experimental orchard mentioned in paragraph 5, the lemon trees are planted in two rows on the western side of the orchard. On the eastern side are Glen Retreat mandarins and oranges for the most part.

The reinfestation of this orchard took place on the eastern face and it was some time before the bugs moved in past the third row of trees.

On another orchard in the same district the lemons are for the most part on the eastern face. In this instance an influx of bugs took place on the lemons and practically stayed there.

In neither of these instances could the bugs have come from another orchard within 15 miles, for all possible sources of infestation of this nature were fumigated and kept under observation. Not only was there no reduction of the numbers of bugs in the surrounding orchards, but in every case an influx took place as nearly as could be discovered at about the same time.

It is thus evident that the adults migrate to the orchards at the time of commencement of each generation.

There is no evidence to support the idea that the migration takes place from one orchard to the other.

Changing host plants is, of course, a very different thing to changing trees.

That there is some movement of bugs directly between orchards is probable, but it is thought that except in the districts in which the orchards are close together this is not important.

No case of sudden diminution of numbers of bugs in any orchard has come under notice, and in every case examined the number of adults found has been comparable to the number of fourth and fifth stage larvæ immediately before. Generally, of course, the adults are present in excess of what might be expected.

It is therefore concluded that the migration takes place between the native host plant and the orchard and not between orchard and orchard.

With respect to the intensity of each migration, the evidence collected points to the fact that the spring numbers are small, the early summer arrivals slightly greater or about the same. The mid-summer is a period of heavy infestations from outside, and the February arrivals are generally rather few in numbers.

Attraction to Lemons.

A further point concerning the characteristics and one which appears to have direct bearing on the migratory habit is the apparent attraction of the bugs to lemons. As far as could be discovered, there is no record of an orchard being heavily attacked by this insect, which did not have a number of lemon trees either in or adjacent to it. The bug has been seen in very small numbers on some lemon free orchards, but it has not been of economic importance on them. Further, in every case it has been found that there is a lemon tree within a few hundred yards of the place.

At Gayndah, Roma, and Rockhampton lemons are grown commercially and in large numbers, and in each of these three districts the insect is of great importance. Of course the climates of these three places are rather similar. Unfortunately, there is no commercial orchard which could be examined and which did not contain some lemon trees. However, at Orallo, 30 miles distance from Roma and with the same general climatic conditions operating, there is one orchard situated in an isolated position. Within half a mile of this grove are many acres of *Eremocitrus glauca*. The orchard contains no lemon tree, and, as far as could be discovered, there was no lemon tree close by it. The bug has so far not been seen on this place.

At Palmwoods, in which district the orchards are set fairly close together, the insect is generally unknown to growers, but every year it causes losses to the two growers known to have lemon trees. At Cooroy, further north, the same state of affairs exists.

At Howard and on the Blackall Range there are very few lemon trees to be found and the bug is very scarce as a general rule. In every case of economic damage brought to notice, it was found that a lemon tree was growing in close proximity.

It is thus indicated that the lemon is the main if not the only source of attraction which induces the bugs to leave the native hosts.

In connection with the habit of migration it was mentioned above that reinfestation after fumigation of the experimental orchard took place on the eastern face, whereas the lemons are all growing on the western. Further, the bugs remained on the eastern side for some time. Not only was this so, but the bugs did not cross to the lemons at any time in large numbers. The lemons are good, heavily-fruiting trees, but apparently the bugs were not greatly attracted to them. In a subsequent fumigation less than 1 per cent. of the bugs in the orchard were found on the lemons.

It would seem, then, the lemon supplies the attraction for the bug to leave its native host, but that once the insect arrives in the orchard it depends on the relative positions of other varieties just where the pest will operate most extensively. On the experimental orchard the wants of the insect are apparently fully satisfied by the Glen Retreat mandarins without any necessity of lemon fruits being obtained. Thus the lemons are almost free of the bugs.

On the other hand, one orchard has been mentioned in which the lemon trees are on the side on which the bugs arrive. By far the greatest damage on this orchard is done to the lemons. Apparently the bugs are here satisfied with the lemons, merely spreading to other favoured varieties by chance or force of circumstances. This is further borne out by the fact that in one part of this orchard a row of lemons runs through the place at right angles to the main lines. These lemons are for the most part affected later and more lightly and the mandarins in the next row to them have been found to harbour more than the average number of bugs for trees of the same variety in the same orchard.

There is, however, very little evidence that the Glen Retreat trees will attract the bugs from the lemons in any numbers sufficiently large to suggest that the latter is less attractive at close range.

On all the evidence it appears that the lemon is attractive over longer distances, but that there is little difference between it and the Glen Retreats at close range. Probably the state of the trees as regards amounts of fruit and foliage is of more moment than variety, in these circumstances.

Injury.

Feeding appears to be confined to the fruits if these be present. It has been shown experimentally that if no fruit be available the insects will feed to a limited extent on the young tender twig growth.

The proboscis is inserted through the rind and appears to just penetrate the pulp.

The insect, of course, feeds by suction. The effects following this differ somewhat according to the variety of fruit.

In the case of lemons less than an inch and a-half in length, the fruit quickly falls after showing premature yellowing. Larger lemons do not drop from the tree so quickly, but the same discolouring usually takes place. With lemons about 1½ to 2 inches in diameter, which is the size most favoured by the bugs, the yellowing is often confined to small areas around the point where the proboscis has been inserted. This size fruit and larger often remain on the tree for a long time after being attacked. At times the premature colouration does not take place to any appreciable extent. In such cases there is often no external characteristic by which an injured fruit can be distinguished with certainty, though often with these an area of the skin can be picked out which has a somewhat blistered appearance.

With oranges and mandarins the premature yellowing invariably takes place, and unless the fruit is well grown it falls from the tree almost immediately. Mandarins particularly fall very easily. Oranges, as has been stated, are not greatly favoured by the pest and except in the spring months it is unusual to find these fruits attacked after they have reached about 2 inches in diameter.

In the spring the late and second crop oranges hang very well after attack, but the yellowing appears to take place very quickly.

Even mandarins appear to hang better after they attain a size of about 2 inches in diameter.

The fact that a great deal less fruit falls after February than before or during that month is due, it is considered, to the fact that the wants of the bug can then be satisfied by less fruits, for these are then much more succulent and also hang better.

Internally the effect of the feeding varies. With all varieties, however, there is a certain amount of drying out of the tissues. In the most severe cases, especially with young lemons, the drying out may be practically complete, but usually the dryness is confined to one or two loculi, this being particularly so in the case of mandarins.

In addition to this drying out, usually in the case of lemons, and less frequently with oranges, an attack by a bug is followed by the formation of a gummy substance inside the fruit.

With the lemon it appears that this is true of every injured fruit larger than 1½ inches in length. With the orange, which most frequently drops from the tree soon after injury, the gumming is not so often found.

Generally speaking, the larger the fruit the more badly it is gummed, providing, of course, natural conditions prevail. The degree of gumming further appears to depend on the extent to which the bug has fed on the fruit and the length of time it remains on the tree after the attack. These factors are no doubt interdependent to a great extent.

The above probably explains why the gumming has not been noted in the case of any variety of mandarin, for these fall so easily when attacked.

Gumming of Fruit.

The gumming appears to follow a disintegration of the tissues and the extent varies within wide limits. In the most severe cases it is found that more than a quarter of the pulp has broken down and its place been taken by the gum. In earlier stages, or perhaps less severe

attack, the gum may be confined to just below the rind and extending for a half inch or less just at the outside rim of the pulp. Occasionally the gum is formed in the rind itself, and then may or may not be present in the pulp.

The disintegration appears to start just under the rind and extend gradually inwards towards the centre. Usually the extension inwards follows along one or more of the septa and, in the more advanced cases, the seed is affected and aborted.

The presence of the gum may be indicated by a somewhat blistered appearance on the rind, but unless the fruit has yellowed there is generally no indication on the outside as to whether or not the fruit is gummed internally.

In a few cases gum is found to extrude from the surface through the puncture which the bug has made. This, however, is rather uncommon.

The absence of some external character by which a gummed fruit may be identified may be followed by loss to the grower, for by marketing gummed fruit his brand may quickly loose its good reputation with regular purchasers.

Fortunately, however, there is one method by which a gummed fruit may be identified with reasonable certainty. It is found that when squeezed in the hand the gummed fruit remains firm, whereas the sound one gives slightly to the pressure. With experience there is little chance of a careful grower culling sound fruit or marketing unsound ones in appreciable quantities.

In addition to this gumming which follows the attack by the bug there is another form found in lemons in Queensland. Frequently the two forms are confused—the bug generally now being held responsible for all such disintegration of the fruits. However, the two forms are distinct in primary origin. The second form corresponds fairly fully with the description given by Fawcett and Lee of what is termed by them Endoxerosis. This form corresponds closely in appearance with that caused by the bug, but the two may be distinguished from one another by the fact that in the case for which the bug is responsible there is always a yellow or brown discolouration of the rind along the path the proboscis has entered, whereas in the other form there is no such discolouration, and the injury is confined to the portion under the rind. The bug injury is most prevalent in the summer months, while the other appears to be practically confined to the cold weather.

It is considered, however, that the production of the gum in both cases is due to the existence of the same fundamental condition in the fruit. From investigations by Coit, Hodgson, and Bartholomew it is known that citrus leaves, when suffering from lack of water, tend to draw on the fruit for supply, and from Fawcett and Lee's conclusions it would appear that in internal decline this drawing off of the water in the fruit is connected with the formation of gum following a disintegration of the tissues.

It would appear possible then that the bugs, by withdrawing the solutions, set up somewhat the same condition in the fruit as is the case when the leaves have to make up their deficiency of water. That is to say, the formation of the gum following an attack by the insect is associated directly with the fact that the water content of the fruit has been lowered, and thus very closely corresponds to the Endoxerosis of California.

E. Jarvis, in 1914, recorded that bacteria were isolated from the gum in lemons, but as he went no further with the work there is no indication of their actual role.

During the course of this present investigation many examinations have been made, but no bacteria have been found in association with a freshly-cut gummed lemon.

Innoculation experiments have been carried out on four occasions. The fruit, in various stages of development, were inoculated with both a sterile needle and with a needle dipped in the gum of another lemon. In no case has the inoculation been followed by the production of a condition resembling that of a gummed lemon. The only effect consistently produced in the treated fruits was the brown discolouration of the rind, very similar in all appearances to that produced by the insertion of the proboscis of the bug. It would thus appear that the possibility of the gum being produced by the action of bacteria is remote.

Whenever bugs were enclosed with fruit on the tree the typical gumming was produced unless the fruit dropped within five days.

Mr. L. F. Mandelson, Assistant Pathologist, carried out cultural experiments using potato dextrose agar medium. Portions of gum and tissue in its vicinity were planted out on to plates of this medium and then incubated at 27 deg. Centigrade for fourteen days. At the end of that time out of twenty-one plantings nineteen were apparently sterile, while two showed some bacterial growth.

Mr. Mandelson, in reporting, stated: "It is considered that this growth was the result of contamination from an external source. Since potato dextrose agar medium is capable of supporting the growth of the vast majority of fungi and bacteria met with in pathological work it is further considered that the gum is sterile."

In view of all the above evidence it is thought that the formation of the gum is brought about by physiological causes and not by bacteria or other organisms, and is in itself fundamentally the same whether forming through the true physiological internal decline or following the attack by the bug.

The only way in which the condition following the bug's work apparently differs from Endoxerosis as described by Fawcett and Lee is that in no case of the former has the gum been found to occur in the wood vessels of the fruit-bearing stem.

Size of Fruit Attacked.

The insect attacks fruit in all stages of development, from that just setting to fully-matured ones.

In general it is found that the most forward fruit available are preferred.

This rule is subject to what has been recorded with respect to varietal preference except in the spring months of the year. At this time the main crop of mandarins is just setting, and it is found then that the bugs will move to what are normally less favoured varieties holding late or second crop fruit which is in an advanced state of development.

This last fact may be put to use, for by keeping this late-maturing fruit under observation during the spring months a trap can be set and the bugs destroyed by systematic handpicking. It will be seen that until the main crop reaches the size of a marble the bugs will, for the most part, attend to lemons and the late oranges.

LIFE HISTORY.

A—Life Cycle.

As is usual for this type of insect there are seven stages in the development—i.e., the egg, five larval instars, and the adult or mature bug. No exception to this number of larval stages has been noted as is sometimes the case with other species of bugs.

With respect to the times taken for development there is a great deal of variation, the principal factors being temperature (probably in conjunction with humidity), and the quantity and quality of available food.

From field observations, it appears that the times of development taken for bugs in the laboratory are rather longer than what is required under natural conditions.

The various times taken for total development in the laboratory are given in tabulated form in Table I.

Table II. gives a summary of the information obtained concerning the development of the various immature stages.

One fact in connection with the data quoted concerning the various maxima and minima must be noted—namely, it is often found that when a particular bug goes through one stage with abnormal rapidity or abnormal slowness this divergence from the average is usually somewhat compensated for in the subsequent development. In Table I. will be found several bugs developing from eggs laid 31st December, 1930. The first of these listed required eleven days to complete the fourth instar, whereas the second took only six days. However, these bugs for fourth and fifth stages together occupied twenty and nineteen days, respectively. It is thus well to remember when reading Table II. that the figures given for maxima and minima are not necessarily as significant as might appear.

Laboratory breeding showed that the times taken for development, in general, did not vary any more between the same period in different years than at the one period of the same pear. For example, the times taken for total development of bugs commencing 3rd March, 1930, varied from forty-two to forty-five days, and those commencing 3rd March, 1931, occupied from thirty-eight to forty-four days.

It will also be noted with regard to individuals developing on or about the same date that generally the times taken for egg hatching and completion of the first and second instars vary but slightly with the different bugs, but that in the last three instars the periods differ greatly. Again, the point concerning compensating times in successive stages has to be remembered.

With regard to the actual periods of development these are set out in the first two Tables, and need not be discussed here.

Under the circumstances in which the work was done, it was not practicable to carry out properly-controlled experiments from which to determine the exact influences of temperature and humidity. As would be expected, there is reason to believe that both these are important factors.

Daily weather data have been noted at Gayndah throughout the whole period of the investigation, and though by this method no definite conclusions could be arrived at, certain facts are strongly indicated,

particularly with regard to the influence of temperature, both on the rate of development and the whole course of reproductive activity.

From Table I. it will be seen that as the summer approaches the rate of breeding accelerates, and that it remains fairly constant through the hot months. When the weather again commences to be cooler the rate is retarded.

A study of the records of maximum and minimum temperatures for each twenty-four hours leads to the conclusion that a lower limiting factor to reproductive activity is provided by a combination of temperatures. This combination consists of a maximum minimum of 40 deg. and a minimum maximum of 80 deg. Fahr. That is to say that, provided the temperatures in each twenty-four hours for about ten days or a fortnight do not fall below about 40 deg., and at the same time reach as high as 80 deg., there will be oviposition. It is difficult to decide which, if either, of these temperatures exerts the greater influence. From all the evidence, it appears that in the spring months the minimum temperature is the more important, while in the autumn the maximum has more bearing. This last is no doubt interdependent with other factors.

The chief of these other factors is probably the state of the trees and their fruit. Lemons differ in their fruiting habits from all other varieties in normal health, and as the lemon provides one of the most favoured foods, it appears more sound to reason from the state of affairs with regard to that variety than from those of other trees which normally have but one setting of fruit each year.

In the spring and autumn, when breeding is stimulated and retarded, respectively, on the lemons, there are fruits in approximately the same stages of development. It would, therefore, seem that breeding is not directly dependent on the state of the fruit.

The one big difference in the state of the trees is the condition as regards the sap. In the spring when development of the bugs is stimulated the sap is rising, whereas in the autumn the sap is going down.

It is possible, then, that if the sap be rising and the temperature for the period mentioned does not fall below 40 deg. there will be reproductive activity, but if the sap be going down the temperature must reach 80 deg. or oviposition will be discontinued.

Of course, temperature plays an important part in the determination as to the flow of sap, and the factors now put forward as being of controlling influence in the breeding of the bug are therefore themselves not independent. To definitely establish this contention concerning temperature influence would require much more time than was practicable to devote to it, but it can be said to agree with all the known facts for two successive years in particular, and with all the indicated facts for more than five years.

With respect to humidity, it appears that, though perhaps accelerating or retarding development according to various degrees of humidity in conjunction with temperature, this does not play a very important part in normal times. At only one period in the course of the last two years did oviposition and development become obviously affected after having commenced or ceased at normal times. This was in January, 1931. During that month the temperature at Gayndah reached 100 deg. on all but four of eighteen successive days, and only on two days was the minimum recorded below 70 deg. It may be that the extreme temperatures (up to 109 deg.) were responsible, but more probably the

very low humidity was the true cause of an almost complete stoppage of both oviposition and larval development. During the period under discussion the humidity was negligible, the leaves of the trees were curled and drooping, and as has been said reproductive activity was at a standstill.

In breeding work in the laboratory it was found that moisture had to be constantly supplied to ensure normal egg hatching and development of first instar bugs.

It may be that this humidity factor explains why *Biprorulus* does not cause more damage in the far west of the State where there are a good number of excellent citrus trees.

At the same time the insect is essentially a dry climate one, and there is no doubt that temperature exercises much more influence over it than do the normal humidities of localities in which the investigation was conducted.

B—Seasonal Life History.

There are four generations each year. The bugs overwinter as adults and oviposition is commenced early in September. The eggs then produced represent the beginning of the spring generation. Egg-laying is continued without interruption from this time onwards until about the end of October.

Development of the first eggs and the bugs to which they give rise is relatively slow, but soon this is accelerated, and it is found that the periods taken for the total development of the later bugs are so much shorter that the adult stage is reached by the great majority of bugs at about the same date.

It is very exceptional to find eggs in the field during the second and third weeks of November, and for all practical purposes it can be considered that oviposition ceases at the end of October, and does not recommence until almost the end of November, at the earliest.

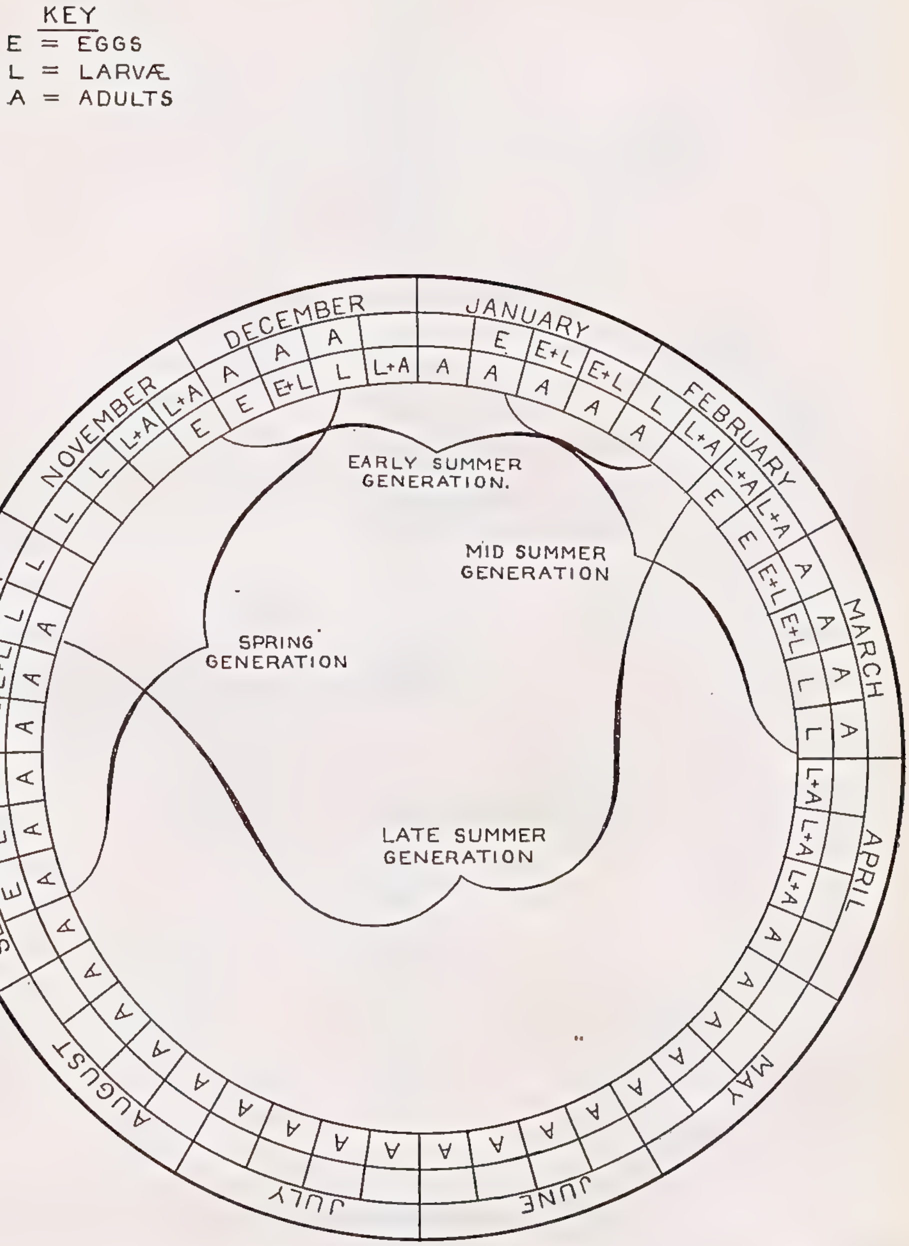
After reaching the adult stage, which in the case of the spring generation is during November, a period of approximately a fortnight elapses before the eggs for the next generation are deposited.

In very late November, then, or more typically early December, a second series of eggs is deposited. From these eggs arise the second or early summer generation bugs.

From now on the development is more rapid than previously, and adults of this early summer brood are to be found in the orchard during the first week in January or even during the last few days of the old year.

A similar pause again occurs before oviposition commences, and then a third or mid-summer generation begins to make its appearance. The rate of development is again rapid, and in general the times occupied by the bugs of this generation in completing their life cycle are approximately the same as those for the previous brood. If anything, the mid-summer bugs are rather quicker in developing. The adult stage is reached again early in February.

Soon reproduction is once more commenced, and the fourth or late summer generation begins. The adults of this brood are those which live through the winter, and ultimately give rise to the spring generation in the following September.



SEASONAL LIFE HISTORY OF BIPRORULUS BIBAX BREDDIN.

I.W. Helmsing after W.A.T. Summerville.

PLATE 142.

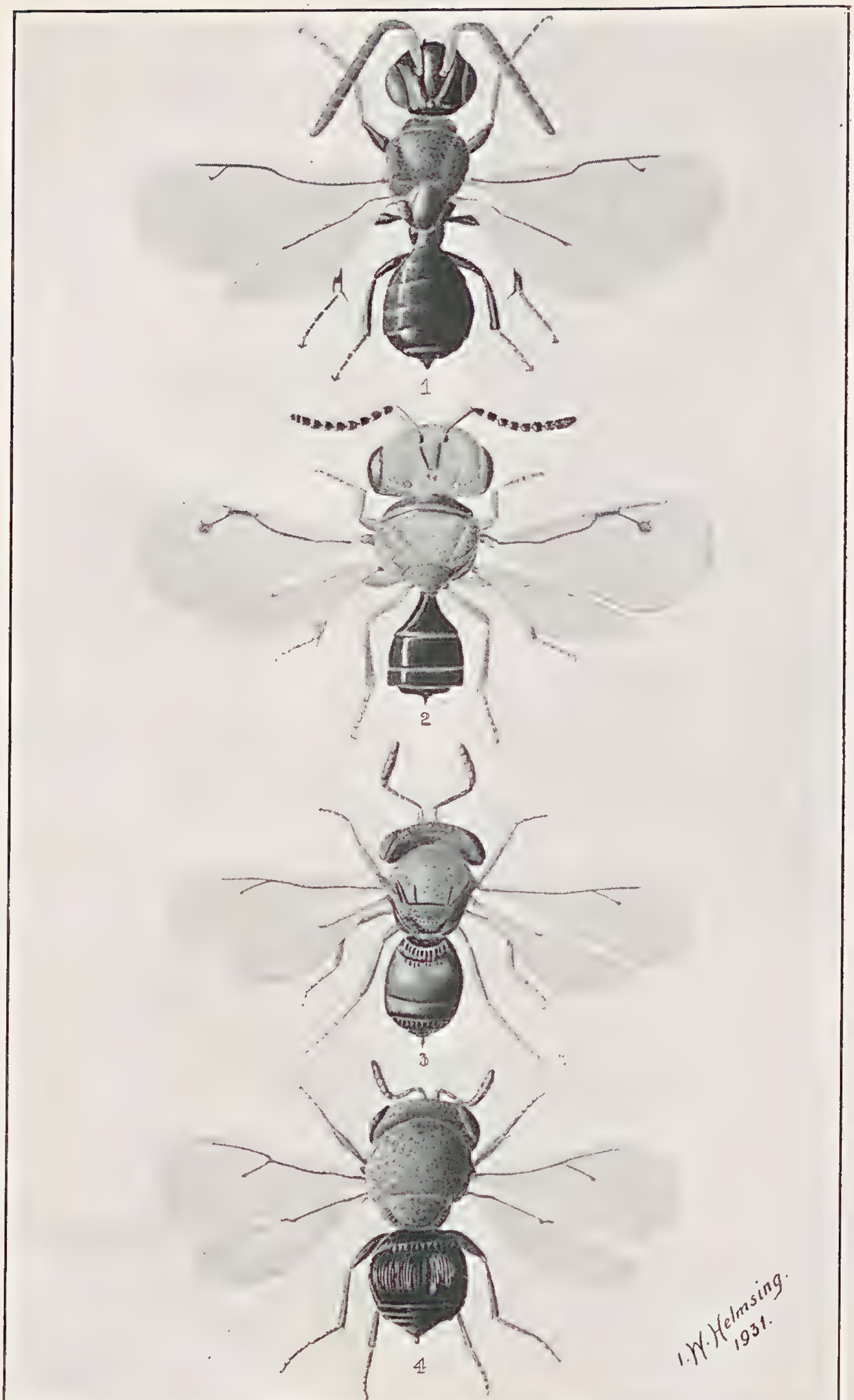


PLATE 143.—EGG PARASITES OF *Biprorulus bibax* BREDDIN.

Fig. 1—*Eupelmus biproruli* Gir.
Fig. 2—*Pachycrepis tectacorisi* Gir.
Fig. 3—*Trissolcus flaviscapus* Dodd.
Fig. 4—*Telenomus biproruli* Gir.

(All figures × 23.)

Egg-laying is carried on with respect to the late summer generation for a rather long period. It commences in mid-February, and apparently is habitually carried on until the end of March. In a normal year bugs developing from these very late eggs show a very high percentage mortality—the experience in the laboratory being that if a bug had not reached the third stage by the middle of April it died before reaching maturity. In an abnormally mild season, such as was experienced during 1931 however, the mortality was not at all high.

In these abnormally mild years it was thought that a fifth generation might possibly be coming through. However, it was found that these late eggs were invariably deposited by adults of the mid-summer generation, and that no female of the late summer brood oviposited before having passed the winter. All late summer generation females which died before the winter were dissected, and none were found to contain any eggs.

A diagram (Plate 142) has been prepared which shows the essential points of the seasonal life history, and this should be read in conjunction with the foregoing notes. In this diagram the typical stages at each period of the year are shown, but it must be remembered that these, of course, are not necessarily the only stages which will be found at these times.

The seasonal life history as given above has been worked out during two years, and though the data for each of the two years agree very closely, it may be that in some subsequent year modifications will have to be made. This is purely a matter for the grower, and observations should always be carried out before accepting the statements as perfectly true for all localities and years. At the same time, it is felt that the variations will not be so great as to materially alter the general scheme as outlined.

During the course of the work observations were made frequently in widely separated localities, and it was found that there was surprisingly little difference in the times of appearance of the respective generations in these districts.

The method used in investigating the seasonal life history was to carry on breeding work throughout the year, and to make frequent periodical visits to the Gayndah district. When the field observations correlated with the data obtained in the laboratory suggested that a generation was nearing completion, fumigation of an entire orchard was carried out, and the orchard thus cleared of bugs. Thus the search for control methods was coupled with the life history work.

In examining an orchard and making counts of any stage of the insect, allowance had to be made for death due to natural causes. For example, if the number of fifth-stage insects was anywhere near that of first stage ones, then in general the fifth was the dominant stage. Actually it was only seldom that confusion was likely, and in all cases the data obtainable from the laboratory could be used to compute the true state of affairs.

Overlapping of Generations.

As has been indicated, egg-laying at the commencement of each generation is carried on for a considerable period. From Table III. it will be seen that the period of fecundity is at times considerably longer than the time required for the full development of individual

Plate 144.

Predatory on *Biprorulus bibax* Breddin.

Fig. 1.—Dorsal view of *Pristhesancus papuensis* Stål. × 6.

Fig. 2.—Lateral view of *Pristhesancus papuensis* Stål. × 6.

bugs. It might, therefore, be expected that a considerable amount of overlapping of generations would occur. Actually, the degree of overlapping is very small.

This is due, it is considered, to the following series of factors:—

The spring generation is begun early in September, and from that time onwards eggs are being laid continuously for about two months. In Queensland the true spring weather conditions are of rather short duration, the transition from winter to summer being fairly rapid. It thus happens that the bugs which are developing in October are maturing in much warmer weather than those which are under way a month earlier. The consequence is that bugs arising from eggs laid in early September take so much longer to complete their various stages than those coming later that the rather wide divergence in the time the eggs are laid is offset to a considerable extent. Thus the adult stage is ultimately reached by the greatest proportion of the bugs at approximately the same period—that is, one egg may be laid, say, a month after another, and yet it is quite possible that the adults will appear within a day or so of one another. Thus there is a combination of a relatively long life cycle and quickly-changing weather conditions tending to equalise the times at which the eggs of the next generation will be laid.

Following this comes the early summer generation. This, as has been recorded, makes its appearance about the beginning of December. At this time in each of the last three years egg parasites were particularly active. So active were they that it was only with difficulty that sufficient material could be obtained with which to carry on laboratory breeding work.

These parasites are particularly active during the first half of the month. At this time over 90 per cent. of the eggs found at Gayndah failed to hatch. The activity, though diminished later, is in evidence for almost the whole month.

Thus the numbers of adults maturing during the early summer is so small that the mid-summer generation starts off as almost a pure race.

From the beginning of the new year, however, overlapping becomes more and more manifest, until from the middle of March onwards it is possible to find bugs in the same instar, but belonging to two different generations.

As will be seen later, it is, fortunately, possible to establish a control of the bugs during January which eliminates, or at least reduces to a minimum, the effects of this overlapping in and after February, in so far as it interests the citrus-grower, except in the most severe infestations.

Natural Enemies.

There are seven known natural enemies of the bug belonging to the insect world.

Of these, the following were identified by Mr. A. A. Girault:—*Eupelmus biproruli* Gir.; *Telenomus glabriscrobis* Gir.; *T. biproruli* Gir.; and *Pachycrepis tectacorisi* Gir. One was identified by Mr. A. P. Dodd as *Trisolcus flaviscapus* Dodd (Plate 143).

These five insects are parasitic on the eggs of the bug. They do excellent work and, as has been indicated, they are particularly active in December. At this time, in both of the years in which observations were made, over 95 per cent. of all eggs collected gave rise to one or other of these parasites. Of the five, *T. biproruli* was the most frequently encountered species.

The spring and mid-summer generation eggs are subject to but a very light attack by these useful insects, but during the month of February in each of the last four years the percentage of parasitised eggs was fairly high. Though undoubtedly much good is accomplished at this time in reducing the numbers of the late summer brood of bugs, the benefit to the grower is mainly derived through the activity on the early summer generation.

The excellent work done by these parasitic wasps, or flies as they are sometimes styled by orchardists, during December is both direct and indirect. Directly, the result is in reducing the actual number of bugs of the early summer, and from that of all succeeding generations; indirectly, the result is in minimising the degree of overlapping of generations. Of the two, probably the latter is the more important.

The reason for this great activity in the early summer is difficult to ascertain. It is possibly due to the fact that the bug by ovipositing in December does so at a period when a great many other species are in post embryonic stages of development. From general observations on Queensland insects, it is concluded that the period of greatest egg-laying activity is during October, and more particularly November. The parasites at this time are no doubt spreading their activities over the eggs of a large number of other species of insects. Then in December these other insects are not so actively ovipositing, and the parasites are thus concentrated on the eggs of a comparatively smaller number. It must be emphasised that reference is being made in comparative terms, and not that it is thought that the actual number of insect species ovipositing in December is small.

The remaining insect enemies are predators. These are bugs which feed on all active stages of the pest. They are *Pristhesancus papuensis* Stål.] (Plate 144), and a small Asopid, the identity of which is not definite, but it seems to be a species of Amyotea. Mr. H. Hacker, to whom specimens were referred, considers that it is probably *A.* (*Strachia*) *erythromela* of Walker. There is little doubt that this is the correct name.

Of these two, though both are responsible for much good work at times, especially against the larval forms, the firstnamed is by far the most valuable. *Amyotea* is rather too spasmodic in its occurrence in numbers to be of much use in controlling the pest.

The efficacy of both of these predators is considerably reduced owing to the fact that their operations are by no means restricted to the pest in question.

Development of the Egg.

As egg parasites are a very important factor in the economy of the pest, it is advisable that citrus-growers should be able to recognise whether or not an egg is ultimately going to give rise to a friend or a bug.

The development of a normal healthy egg (Plate 139) is very characteristic, and many of the changes are visible to the naked eye. The following is a description of the changes in the appearances of a normal, rather slowly developing, egg:—

The egg was laid between 5 p.m. on Wednesday and 8 a.m. on Thursday. When first found, it was slightly more translucent at the top or micropylar region than elsewhere. Later, this difference disappears. By Saturday morning, towards the base of the egg, two scarlet

spots somewhat elongate in shape could be seen (these are the eyes). Lower down there were two sets of orange-coloured markings (these are the basal and apical joints of the antennæ). Between the eyes and extending downwards could be seen the central portion of the head coloured orange. A rather more opaque area marks the position of the proboscis, but this is difficult to see without a lens. By Sunday night a dark ⊥-shaped mark appears above the head and eyes (this is the egg burster). By next morning the egg burster appeared as an almost black triangular area. The antennæ were becoming somewhat brownish in colour, and the legs could now be seen as dark lines towards the base of the egg. By Tuesday all these parts were showing more prominently. The egg commenced to hatch at about 8.30 a.m. on Wednesday. After the egg had hatched, the black triangular egg burster remained fixed to the rim of the lid or operculum.

The above development was typical in all particulars of every normal egg, though, of course, in the hot weather the rate will in general be much quicker, and consequently the time of appearance of the various parts of the embryo will be earlier in such cases than was the case with the one described.

It may be noted that at times the developing embryo changes its position relative to the shell in which it is enclosed—the head being moved nearer the micropyle.

It will also be noted that the position of the embryo in every egg of a batch in most instances is almost exactly the same—i.e., if the head appears on the left side of the egg in one egg it will be on the left side of every egg, and almost the same distance from the rim of the operculum. This gives a batch of developing eggs a very characteristic appearance, and enables the various parts mentioned above to be very readily observed.

When an egg is parasitised (Plate 139) or infertile, the only colour changes which take place do so over almost the whole surface more or less uniformly.

The infertile egg usually collapses in parts and becomes grey or remains pearly in colour.

The parasitised egg when in an advanced state is pearly cream colour, with the micropyle somewhat grey.

It is advisable for growers to make themselves familiar with the appearance of a normally developing egg, and thus be in a position to recognise whether or not the egg will finally give rise to a bug.

It will be found that in general if one egg of a batch is parasitised, then every egg in that batch is in the same state. It is very unusual to find only a portion of a batch so attacked. Infertile eggs are seldom found in an orchard.

CONTROL.

A—General Considerations.

In the study of how a pest may be most efficiently controlled, when considering any actual mechanical, chemical, or other mode of killing the individuals, the various points of the life history and habits of the insect have to be taken into full account. Though every such point is of some

moment, there are generally a few which are of outstanding importance. In the case of the Larger Horned Citrus bug, the most important facts are:—

1. The insect feeds by sucking the juices of the plant, and this is accomplished by inserting the proboscis below the surface of the host.

2. The outside covering or exoskeleton of the pest's body is very hard, and would be difficult to penetrate directly with chemicals which would not harm the plant.

3. The species goes through four life cycles per annum. Overlapping of these generations is of no great extent before February. From the end of February onwards the overlapping may become very pronounced.

4. The only period between September and April in which eggs are very rarely laid is during the first three weeks of November (this time may vary, as has been pointed out). During the winter months the adult is the only stage in which the insect is to be found.

5. Just prior to each egg-laying period there is the probability of adults arriving in the orchard, having migrated thence from the native host plant.

6. It is economically impossible to remove the known sources of this infestation, and even if this were practicable it is considered possible that there is at least one other host which is not known as yet.

7. The intensity of the migrations varies. During the years in which the investigation was in progress, the spring arrivals were of little direct importance. The number arriving in early summer was also small. The migration of adults, in late December and early January, which give rise to the eggs of the mid-summer generation, is of the utmost importance, not so much from the point of view of numbers, though these are considerable, but more particularly on account of the subsequent breeding. The last migration is of no great importance except in extreme cases, which are rare.

8. The migration is usually intense for not longer than a fortnight; usually it takes place from one direction only.

9. Egg parasites are responsible for a great reduction in the number of early summer generation bugs, and for an appreciable diminution in the number of bugs developing late in February or early March.

10. The evidence obtained all points to the fact that the bug is attracted from long distances into the orchard by lemons only.

11. The bugs during the spring months favour late and second-crop fruit, which is in an advanced stage of development, in preference to the recently set fruit of what might, at all other times, be a very desirable variety to them.

12. For preference a bug will select a thickly leafed tree to one of the same variety with more scanty foliage.

13. The bug spends the greater part of the day on the fruit, and is most easily observed from four o'clock onwards till dusk or early in the morning.

14. Flying is generally undertaken to any extent only after the sun has begun to get low on the horizon. When molested, the bug is more likely to endeavour to escape by crawling than by flying—at least, in the first place.

15. Clusters of adults may occasionally be found in the trees during the winter.

16. The longest period over which egg-laying has been noted by any normal female is eighty-one days.

17. Egg-laying does not commence until about a fortnight after the adult stage has been reached.

18. The times occupied in development at any period of the year are important, particularly those of the egg and complete life cycle.

B—Means of Control.

From the fact recorded in "A," paragraph 1, it will be at once apparent that stomach poisons administered in the form of a spray or dust will be quite useless against the insect.

Owing to what was recorded in "A," paragraph 2, it would not be expected that any but the strongest contact insecticides would be at all effective.

However, the effect of each of the more commonly used contact insecticides was tested. It was found that none of these had any appreciable lethal action on the pest. Nicotine sulphate, even at strengths far in excess of those usually employed, was shown to be quite useless.

Lime sulphur wash used at 1 to 8 appeared to have some deterrent action. Certainly the adults left the sprayed trees; but that they would actually leave an orchard sprayed throughout is very doubtful. At all events, the spray is useless against this pest, as it could not be used at the required strength at the times most needed, for the trees would be very badly damaged.

A resin wash made to the formula 2 lb. resin and 1 lb. washing soda to 30 gallons of water when applied early in the morning effectively brought adults and the last two-stage larvæ to the ground. These bugs when brought down were incapable of flying or any quick movement. They could thus be collected and destroyed. None but the very young larvæ were killed. The spray is difficult to handle effectively, and its general use could not be recommended on the results obtained in the tests.

A spray made up as follows was found to be effective against all the active stages of the bug:—10 lb. of finely-ground resin is mixed while dry with 3 lb. of good commercial caustic soda, and the mixture boiled until a clear dark solution is obtained. To this solution is added 1½ lb. fish oil, and the whole boiled for a few minutes.

For the boiling, 2 gallons of water are used. As the solution expands greatly when hot, the container used should hold at least 4 gallons, otherwise boiling over may take place. The solution thus obtained is then diluted to 40 gallons by the addition of 38 gallons of cold water. Actually, the volume of the solids will make the final volume slightly more than 40 gallons.

This spray must not be used in the very hot weather, as burning of the fruit and twigs may occur at that time.

This last fact reduces the value of the spray as a means of controlling the pest, but at the time when control measures are most needed, there are very few spray materials known which could be used without some ill effects on the tree resulting.

Fumigation by the use of hydrocyanic acid gas has been tested, and when this gas is generated from calcium cyanide, has been proved to be very effective.

When generated by the interaction of sulphuric acid and either potassium or sodium cyanide, however, hydrocyanide acid gas does not give the same satisfactory results.

When this so-called pot method is used, the bugs are quickly brought to the ground, but it was found that up to 40 per cent. of the bugs thus dislodged from the trees recovered after a few hours' exposure to pure air. If the pot method be used, it is necessary to collect by hand the bugs which fall, and then destroy them by some other means.

The reason for this difference in the results following the use of the same fumigant lies, no doubt, wholly in the method of its production. With the pot method, the gas is generated very quickly, while when calcium cyanide is used, the evolution of the gas is slower and extends over practically the whole forty-five minutes usually allowed.

The inferiority of the pot method may be accounted for by there being a greater loss of the gas due to the sudden rush with which it is produced.

More likely the superiority of the slower method is due to the following:—When the gas first envelopes the insects after having been liberated merely by the action of the atmosphere, it does so in sufficient quantity only to cause them some discomfort. They are thus able to follow their inclination to grip the tree more firmly. The gas continues to come to them more or less gradually, and by remaining on the tree they receive a larger quantity than they would have had they fallen at once. With the acid-using methods the insects are almost instantaneously enveloped in an atmosphere containing a high concentration of the poison. They are thus at once stupified, and fall to the ground. The gas in this case is being evolved so that it comes into the atmosphere of the tent at some height above the ground. Hydrocyanic acid gas is lighter than air, and therefore tends to rise. The insects by falling to the ground thus quickly pass to a region of low concentration. On the other hand, when the gas is being evolved from calcium cyanide dust, the evolution of the gas is taking place from the ground level over a large area under the tent. The bugs will thus not usually pass to a less heavily laden region.

The first part of this theory is substantiated by the fact that when calcium cyanide is used at 100 per cent. dosage for thirty minutes, the kill is about 5 per cent. lower on the average than when forty-five minutes is allowed. With potassium cyanide the kills are about the same with both periods.

The second part is supported by the fact that even 50 per cent. dosage of the dust form gave a better kill than the full strength potassium. When the 50 per cent. dose of the dust is used, it will be found that a number of the bugs brought down (up to 12 per cent.) recover.

A kill of 80 per cent. can be constantly obtained, using the dust at 50 per cent. for the full forty-five minutes, but if this dosage be used, it is advisable to pick up and mechanically destroy as many of the fallen bugs as may be practicable.

The tests which were made showed that by using calcium cyanide 100 per cent. dosage for forty-five minutes at least a 95 per cent. kill will be obtained against all active stages of the bug.

It will be found that after removing the tent a proportion of the fallen bugs are still alive, though very sluggish. It was proved that even when given every protection, less than 2 per cent. of the fallen insects ultimately lived. Sometimes two days elapse before they finally die, but there is no doubt that if allowed to remain in the orchard exposed to the weather, attack by ants, &c., that the percentage recovering would be even smaller. Growers, therefore, need not be concerned about these moving insects which are sometimes to be observed.

Catching the insects and destroying by hand is, of course, far too slow and too costly to be carried out on a very large scale, even if practicable. However, handpicking in conjunction with other methods is very useful, and the practice is by no means to be discouraged. Even when carried out haphazardly much good may be accomplished by this handpicking, and when done systematically and with due regard to relevant points of the life history and habits, it is often all that is required in some districts. However, consideration must be given to these points, as otherwise much time may be wasted. For example, to set out on a handpicking expedition during the middle of a hot day because it is then a congenial task is useless, because for every bug seen it is probable that a dozen at least will be effectively hidden in the thicker parts of the tree. This sort of mistake is often made.

C—Recommendations.

The following methods of combating the pest have been adopted on the assumption that the seasonal life history will be the same for most years, as was found to be the case during the last two years. The methods have been tested and shown to be quite adequate for heavy infestations of the insect.

The recommendations are so worded that they apply directly to the Gayndah district unless some other locality is specifically mentioned. Though there is evidence that the data and facts on which they are based do not vary much in different districts or different years, it is advisable for growers to carry out sufficient observations to learn whether any adjustment of time is necessary before accepting them as true for all places and years.

(*a*) Where lemons are grown, particularly if in quantity, it is advised that all other varieties of citrus should be stripped of mature or second-crop fruit as early in the spring as it is economically possible to do so. The first eggs are laid in early September, and therefore the best results will be obtained by stripping before that month.

By carrying out this stripping, the adults will be attracted to the lemons, and therefore for the main part to a limited number of trees. This recommendation will be understood from what has been briefly recorded in paragraphs 5, 10, and 11 of "A," and from what has been recorded of the seasonal life history and varietal preference. Depending on the intensity of the infestation following the arrival of bugs from the native host, the lemons should then be systematically handpicked or fumigated. In general, handpicking should suffice, but when fumigation is necessary, this should be delayed until November, if at all possible. This delay is advised for two reasons—during this month eggs are practically absent and a better kill of scale insects will be obtained at that time than would be the case if the work were done earlier in the season.

Handpicking should be systematically carried out and practised either early in the morning or late in the afternoon. Refer to paragraph 13 of "A."

(*b*) Where it is not economically possible to remove all late and second-crop fruit by the time specified in (*a*), at least remove all the fruit from other varieties, particularly favoured mandarins. The older fruit, which, of course, will be nearly always oranges, should then be regularly examined, and bugs found on them dealt with at short intervals. The late fruit is thus really being used as a trap crop. If correctly carried out, this recommendation can be put to great service, but if the attention given is not thorough, these trap trees will probably act as a prolific source of bugs. Further, when the orchard has been planted in such a way that these late varieties are indiscriminately mixed with mandarin trees, it is not a safe procedure to rely too much on the attraction of the mature fruit for the insect. When fresh planting is contemplated, it will be wise to bear this fact in mind.

(*c*) From what has been recorded in brief in paragraphs 7 and 9 of "A," it will be seen that it will be seldom necessary to apply control measures in early December, particularly if recommendations (*a*) and (*b*) have been carried out. If the number of bugs in an orchard seems to be very great, it will be advisable to collect a few batches of eggs from various parts of the orchard, and watch their development. If the parasites are not so active as would be necessary to adequately reduce the number of bugs, confine the control measures to handpicking if possible, otherwise use the resin, caustic soda, fish oil spray. Fumigation should not be undertaken if at all avoidable. If this last be used, half-strengths followed by picking up of fallen bugs should be employed.

If the parasites be reasonably active, it is worth while risking breeding a few extra bugs rather than killing many useful insects by indiscriminately destroying all eggs.

(*d*) In January, control measures will most likely be required. In fact, it is considered that this is the key period in the successful control of the pest. The other recommendations are essentially of but secondary importance to most orchardists.

Fumigation by the use of calcium cyanide should be carried out as soon as the migration of adults to the orchard has lost its intensity. The actual time may vary, but during the period of the investigation fumigation commenced during the latter portion of the second week in January met with great success. By delaying too long, the females will be allowed to commence ovipositing, and by starting too early, all the migrating adults will not yet have arrived in the orchard. The margin of safety is not large, but it is sufficient if the required observations are made.

The fumigation operations should be commenced on the side of the orchard remote from the source of infestation, and advanced towards that direction.

The reasons on which this recommendation is primarily based will be found in paragraphs 4, 5, 7, 8, 10, and 17 of "A." If this recommendation be not carried out, overlapping of the broods may make it necessary to fumigate twice in February, as described in (*e*).

(*e*) If the previous recommendations, especially (*d*), have been correctly carried out, it will be found that in the vast majority of cases

no further efforts need to be made to cope with the pest. Of course, handpicking will at all times be carried out, when the opportunity offers, by careful growers.

In very extreme cases the infestation may be so great, due to a prolonged migration, that a second fumigation is necessary. If this be the case, the double cyaniding may be done, using half-strength dosage for one or other, preferably the first. The second fumigation should follow the first at an interval of not less than six days, and not more than about thirty days. These times are dictated by the rate of development of the eggs and the period occupied by the bug in completing its life cycle at this time of the year. The eggs may take up to six days to hatch, and though the adult may mature in less than thirty days, an extra few days can be allowed because reproductive activity does not follow immediately on maturation.

(*f*) In districts such as Howard and the Maroochy area, it is recommended that unless lemon trees are of some commercial value, they should not be grown near an orchard. If such lemons be retained, close observations should be made at the time of commencement of each generation, and all bugs found on them destroyed at once.

(*g*) When planting a new orchard in a district in which the direction of infestation is known, the lemon trees should be planted on that face of the orchard nearest the source of infestation. This will have the effect of retarding the spread of the pest through the orchard.

(*h*) As the bugs prefer the more heavily foliaged trees, it is advisable to keep trees of favoured varieties pruned out as well as possible, giving due consideration to other effects of this on the trees.

(*i*) When pruning in the late winter close watch should be kept for clusters of adults in the trees, and when found these should be at once destroyed.

(*j*) Finally, on account of the destructiveness of the species, and the fact that when climatic conditions favour it, it is likely to cause severe damage in almost any district, no opportunity should be lost of destroying individuals, even though the bug may not be known as a pest on the particular orchard. It must be regarded as at least a potential pest of every citrus-grower in the State.

Acknowledgments.

In the course of this investigation, orchardists in many districts have given every assistance possible, and thanks are tendered to them. In particular, throughout the Gayndah district growers have given very valuable help, and though it is difficult to discriminate, Messrs. R. A. Ulcoq, T. Gishford, and M. Kenny, without whose assistance the work would have been at least prolonged, may be specially mentioned.

On the technical side, thanks are due to those members of Head Office staff who have assisted at all possible times. Mr. A. R. Brimblecombe's help in the laboratory made it possible to carry on breeding work throughout the year without interruption, and the efficiency with which the work was done is shown by the high percentage of available insects he successfully reared from egg to adult. Mr. I. W. Helmsing's artistic contributions are as excellent as ever. And, finally, Mr. Robert Veitch's valuable advice, given whenever sought, was much appreciated, as also was his courtesy in making available the help of members of Head Office staff.

TABLE I.

PERIODS TAKEN BY INDIVIDUAL BUGS TO COMPLETE LIFE CYCLE.

Egg Laid.	Developmental Periods in Days.							Reached Adult.
	Egg.	First Instar.	Second Instar.	Third Instar.	Fourth Instar.	Fifth Instar.	Total.	
Spring Generation.								
7–9–29	12	6	11	13	13	20	75	21–11–29 22
10–10–30	5	5	7	8	7	10	42	22–11–30
10–10–30	5	5	7	8	9	9	43	23–11–30
10–10–30	5	5	7	9	10	13	49	29–11–30
10–10–30	5	5	8	8	7	12	45	25–11–30
15–10–30	6	6	9	8	7	9	45	29–11–30
24–10–30	5	5–6	11–12	14	14	10	60	21–12–29
31–10–29	7	5	8	2–4	7–9	16	47	18–12–29
31–10–29	7	6	8	5	8	10–11	44–45	15–16–12–29
Early Summer Generation.								
8–12–30	4	5	6	4	4	7	30	7–1–31*
11–12–30	4	4	5	5	9	12	39	19–1–31*
11–12–30	4	4	5	8	6	8	35	15–1–31
11–12–30	4	4	5	7	10	9	39	19–1–31*
13–12–30	5	4	3	5	6	7	30	12–1–31†
13–12–30	5	3	6	9	7	14	44	26–1–31
14–12–29	4	5	2–4	10–12		9	32	15–1–30§
14–12–29	4	4–5	4–5	10		9	32	15–1–30
14–12–29	3	4	6	15		9	37	20–1–30§
14–12–29	3	4	6	13		11	37	20–1–30
14–12–29	3	4	6	10		14	37	20–1–30‡
14–12–29	3	3	4	20		8	38	21–1–30‡
14–12–29	3	3	4	20		9	39	22–1–30‖
14–12–29	3	3	4	15		12	37	22–1–30
14–12–29	3	3	4	21		10	41	24–1–30
14–12–29	3	3	4	21		11	42	25–1–30
14–12–29	3	3	4	20		15	45	28–1–30‡
14–12–29	3	3	4	24		11	45	28–1–30
17–12–30	4	3	5	7	7	14	40	26–1–31*
17–12–30	4	3	5	7	7	11	37	23–1–31*
17–12–30	4	4	6	5	5	7	31	17–1–31†
17–12–30	4	4	6	5	5	8	32	18–1–31†
17–12–30	4	3	6	6	7	8	34	20–1–31*
17–12–30	4	4	6	5	5	10	34	20–1–31
17–12–30	4	4	6	6	5	9	34	20–1–31†
17–12–30	4	4	6	6	6	8	34	20–1–31*
17–12–30	4	3	6	6	7	10	36	22–1–31*
17–12–30	4	4	7	6	7	10	38	24–1–31†
17–12–30	4	4	6	7	7	11	39	25–1–31†
17–12–30	4	4	6	6	7	13	40	26–1–31*
18–12–30	5	2	6	5	4	5	27	14–1–31†
18–12–30	5	2	6	5	4	6	28	15–1–31*
19–12–30	4	4	4	5	5	8	30	18–1–31†
19–12–30	4	4	5	4	5	10	32	20–1–31*
19–12–30	5	4	3	5	6	10	33	21–1–31*
19–12–30	5	4	3	6	8	12	38	26–1–31*
19–12–30	5	4	3	9	7	10	38	26–1–31†

* Male. † Female. ‡ 2 Bugs. § 3 Bugs. ‖ 6 Bugs.

NOTE.—The number of bugs bred in the laboratory was too large to admit of the inclusion of all; the above are representative.

TABLE I—*continued.*

PERIODS TAKEN BY INDIVIDUAL BUGS TO COMPLETE LIFE CYCLE—*continued.*

Egg Laid.	Developmental Periods in Days.							Reached Adult.
	Egg.	First Instar.	Second Instar.	Third Instar.	Fourth Instar.	Fifth Instar.	Total.	
				Mid Summer Generation.				
31–12–30	3	3	4	6	11	9	36	5–2–31
31–12–30	3	3	5	3	6	13	33	2–2–31†
31–12–30	3	3	5	4	8	10	33	2–2–31†
31–12–30	3	3	4	6	8	9	33	2–2–31*
31–12–30	3	3	4	6	10	12	38	7–2–31*
3–1–31	4	3	3	6	6	8	30	2–2–31*
3–1–31	4	3	3	6	6	9	31	3–2–31†
3–1–31	4	3	3	4	8	10	32	4–2–31*
3–1–31	4	3	3	4	8	10	32	4–2–31*
3–1–31	4	3	3	5	11	8	34	6–2–31
3–1–31	4	3	3	5	10	9	34	6–2–31*
3–1–31	4	3	3	5	10	9	34	6–2–31*
3–1–31	4	3	3	5	10	9	34	6–2–31†
3–1–31	4	3	3	6	7	11	34	6–2–31†
3–1–31	4	3	3	5	11	9	35	7–2–31†
3–1–31	4	3	3	5	11	9	35	7–2–31*
3–1–31	4	3	3	8	8	9	35	7–2–31*
3–1–31	4	3	4	6	9	10	36	8–2–31
3–1–31	4	3	3	5	10	11	36	8–2–31†
3–1–31	4	3	4	7	13	11	42	14–2–31†
31–1–31	5	4	7	5	5	8	34	6–3–31†
31–1–31	5	4	8	5	5	8	35	7–3–31*
31–1–31	5	4	7	4	5	8	33	5–3–31†
				Late Summer Generation.				
18–2–31	4	4	4	6	4	7	29	19–3–31*
18–2–31	4	4	5	4	6	10	33	23–3–31†
18–2–31	4	4	5	4	5	15	37	27–3–31†
18–2–31	4	4	5	4	5	12	34	24–3–31‡
19–2–31	5	4	5	5	7	9	35	26–3–31*
19–2–31	5	4	7	3	8	14	41	1–4–31†
19–2–31	5	4	5	4	6	13	37	28–3–31†
19–2–31	5	4	5	5	6	15	40	31–3–31*
19–2–31	5	4	5	5	6	17	42	2–4–31‡
19–2–31	5	4	5	4	7	10	35	26–3–31‡
22–2–31	6	3	6	7	5	10	37	31–3–31†
22–2–31	5	4	5	3	5	8	30	24–3–31*
22–2–31	6	3	6	5	6	13	39	2–4–31*
22–2–31	5	4	5	3	4	18	39	2–4–31†
22–2–31	6	3	6	5	5	9	34	28–3–31*
23–2–31	6	3	6	3	6	12	36	1–4–31*
23–2–31	6	3	6	4	10	16	45	9–4–31†
24–2–31	5	4	7	5	6	10	37	2–4–31*
24–2–31	5	4	6	7	8	16	46	11–4–31*
25–2–31	5	3	7	5	5	9	34	31–3–31*
26–2–31	5	3	6	6	10	13	43	10–4–31*
26–2–31	5	4	4	10	8–9	18–19	50	17–4–31†
26–2–31	5	4	4	5	6	10	34	1–4–31†
26–2–31	5	4	4	6	6	10	35	2–4–31†
27–2–31	5	3	6	7	7	15	43	11–4–31*
27–2–31	5	3	5	6	10	23	52	20–4–31†
28–2–31	5	4	5	4	8	18	44	13–4–31*

* Male. † Female. ‡ 2 Bugs. § 3 Bugs. ‖ 6 Bugs.

NOTE.—The number of bugs bred in the laboratory was too large to admit of the inclusion of all; the above are representative.

TABLE I—*continued.*

PERIODS TAKEN BY INDIVIDUAL BUGS TO COMPLETE LIFE CYCLE—*continued.*

Egg Laid.	Developmental Periods in Days.							Reached Adult.
	Egg.	First Instar.	Second Instar.	Third Instar.	Fourth Instar.	Fifth Instar.	Total.	
				Late Summer Generation—continued.				
28–2–31	5	4	5	6	8	12	40	9–4–31†
28–2–31	5	4	6	5	11	14	45	14–4–31*
28–2–31	5	4	6	5	8	20	48	17–4–31*
28–2–31	5	4	6	7	10	10	42	11–4–31*
3–3–30	7	3–4	4–5	4	9	14	42	14–4–30
3–3–30	7	3–4	4–5	6	8	13	42	14–4–30‡
3–3–30	7	3–4	4–5	6	11	11	43	15–4–30‡
3–3–30	7	3–4	4–5	5	11	14	45	17–4–30‡
5–3–30	6	4	5	6	7	12	40	14–4–30
5–3–30	6	4	5	5	7	13	40	14–4–30
5–3–30	6	4	4	5	8	14	41	15–4–30
5–3–30	6	4	6	5	7	14	42	16–4–30
5–3–30	6	4	5	7	7	14	43	17–4–30
3–3–31	4	3	4	6	8	15	40	12–4–31†
3–3–31	5	3	9	6	7	8	38	10–4–31*
3–3–31	5	3	6	7	7	9	37	9–4–31*2
3–3–31	5	3	6	6	10	10	40	12–4–31†
3–3–31	5	3	6	6	10	14	44	16–4–31*
3–3–31	5	3	6	6	8	11	39	11–4–31*
6–3–31	4	4	4	5	6–7	9–10	33	8–4–31*
6–3–31	4	3	7	6	7	10	37	12–4–31†
6–3–31	4	3	7	6	7	11	38	13–4–31*
9–3–31	4	4	6	9	9	17	49	27–4–31*
9–3–31	4	4	6	8	10	12	44	22–4–31*
9–3–31	4	3	5–6	4–5	6	11	34	12–4–31*
9–3–31	4	4	7	9	12	15	51	29–4–31*
9–3–31	4	4	7	9	7	12	43	21–4–31*
12–3–31	4–5	3–4	5	7	12	18	50	1–5–31*
12–3–31	4–5	3–4	6	6	15	20	55	6–5–31*
12–3–31	4–5	3–4	6	6	6	13	39	20–4–31†
12–3–31	4–5	3–4	5	7	8	12	40	21–4–31†
12–3–31	4–5	3–4	5	7	9	13	42	23–4–31†
19–3–31	4	5	6	7	8	11	41	29–4–31†
19–3–31	4	5	6	7	8	15	45	3–5–31†
19–3–31	4	5	5	6	7	13	40	28–4–31*2

* Male. † Female. ‡ 2 Bugs. § 3 Bugs. ‖ 6 Bugs.

NOTE.—The number of bugs bred in the laboratory was too large to admit of the inclusion of all; the above are representative.

TABLE II.

Data concerning Development of each Stage.

Generation.	Maximum.	Minimum.	Average.	Number.
	Days.	Days.	Days.	Eggs.
Egg Stage.				
Spring { Early Spring	12	5	8	68
Spring { Late Spring	7	5	6	228
Early Summer	5	4	4	108
Mid Summer	5	3	4	208
Late Summer	6	3	4–5	1,230
First Instar Stage.				Bugs.
Spring { Early Spring	7	4	6	53
Spring { Late Spring	6	4	4–5	48
Early Summer	5	2	3–4	55
Mid Summer	4	2	3	148
Late Summer	5	3	3–4	821
Second Instar Stage.				
Spring { Early Spring	14	8	11	14
Spring { Late Spring	11	6	8–9	28
Early Summer	9	3	5–6	47
Mid Summer	10	2	5	116
Late Summer	14	3	5	593
Third Instar Stage.				
Spring { Early Spring	13	10	11	6
Spring { Late Spring	15	5	11	20
Early Summer	10	4	6	37
Mid Summer	10	3	5	80
Late Summer	10	3	6	382
Fourth Instar Stage.				
Spring { Early Spring	13	13	13	1
Spring { Late Spring	10	7	9	9
Early Summer	12	5	6–7	36
Mid Summer	13	4	7	72
Late Summer	17	4	7	262
Fifth Instar Stage.				
Spring { Early Spring	20	20	20	1
Spring { Late Spring	14	11	11	6
Early Summer	16	9	9	52
Mid Summer	13	9	9	67
Late Summer	23	7	12	176

TABLE III.

OVIPOSITION TEST SERIES.

Series.	Became Adult.	Segregated with Male.	Oviposition Commenced.	Oviposition Ceased.	Period from Maturity to First Egg Laid.	Period of Fecundity.	Total Number of Eggs Laid.	Remarks.
					Days.	Days.		
P. 31·1 ..	14 Feb., 1931	14 Feb., 1931	28 Feb., 1931	1 Apr., 1931	14	32	48	Died 7th April, 1931; contained nine eggs when dissected.
P. 31·3 ..	..	14 Feb., 1931	7 Mar., 1931	29 Aug., 1931	*21	†175	105	Died 29th August, 1931; contained no eggs when dead.
P. 31·4 ..	..	14 Feb., 1931	21 Feb., 1931	13 May, 1931	*7	81	199	Died 17th May, 1931; contained two eggs when dissected.
P. 31·5 ..	..	14 Feb., 1931	26 Feb., 1931	29–30 Mar., 1931	*12	31–32	166	Died 8th April, 1931; without eggs after death.
P. 31·6 ..	..	14 Feb., 1931	27 Feb., 1931	29–30 Mar., 1931	*13	30–31	118	Six eggs found on dissection, 31st March, 1931.
P. 31·2 ..	5 Mar., 1931	5 Mar., 1931	21 Mar., 1931	14 Sept., 1931	16	†177	68	Died 25th September, 1931; contained six eggs when dead.
P. 31·7 ..	6 Mar., 1931	6 Mar., 1931	22 Mar., 1931	7 Apr., 1931	16	16	25	Died 23rd April, 1931; contained no eggs when dead.
P. 31·8 ..	19 Feb., 1931	19 Feb., 1931	..	..	..	0	0	The only apparently barren female found; died 23rd April, 1931.
P. 31·9 ..	19 Feb., 1931	19 Feb., 1931	6 Mar., 1931	29–30 Mar., 1931	15	23–24	55	Died 9th April, 1931; no eggs found when dissected.
P. 31·10..	19 Feb., 1931	19 Feb., 1931	10 Mar., 1931	13 Mar., 1931	19	3	25	Died 7th April, 1931; no eggs found when dissected.

* This is the minimum period; it may have been slightly longer, as the exact date on which the insect reached the adult stage was not recorded in this case. It is certain, however, that this female had not laid prior to the commencement of the test. † P. 31·2 and P. 31·3 behaved abnormally in that they were Mid-Summer brood bugs, which, after ovipositing at the usual time, lived and subsequently behaved just as do late summer adults. They thus gave rise to young of two generations. Such abnormality was extremely rarely met with.

RATIONS FOR DAIRY COWS.

E. H. GURNEY, Senior Analyst.

FEEDERS of dairy stock frequently forward to the Department lists of food material available to them, desiring to know how to make balanced rations from such material. On account of this it was thought that examples of rations made up with various feeds might prove useful, some of the examples being composed of food-stuffs named in the lists mentioned above.

The Agricultural Chemist, Mr. J. Brünnich, has written a pamphlet entitled ''Stock Foods,'' in which the objects of feeding, description and analyses of various stock foods, and the making up of rations are all very fully detailed, and with this information the dairy farmer can judge how to feed to the best advantage.

Modern experience has shown that rations with somewhat lower protein content than was previously considered necessary can be successfully used.

Examples of rations computed from analyses of feed-stuffs contained in ''Stock Foods'' are given below, and are in accordance with the feeding standards for dairy cows published in ''Feeds and Feeding Abridged,'' by Henry and Morrison.

Professor J. K. Murray states that this standard is referred to in lectures in the Agricultural Course at the Queensland University.

Henry and Morrison Feeding Standard.

—	Digestible Crude Protein.	Total Digestible Nutrients.
Dairy Cows.		
For maintenance of a 1,000-lb. cow	0·700	7·925
To allowance for maintenance add—		
For each 1 lb. of 2·5 per cent. milk ..	0·045—0·053	0·230—0·256
For each 1 lb. of 3·0 per cent. milk ..	0·047—0·057	0·257—0·286
For each 1 lb. of 3·5 per cent. milk ..	0·049—0·061	0·284—0·316
For each 1 lb. of 4·0 per cent. milk ..	0·054—0·065	0·311—0·346
For each 1 lb. of 4·5 per cent. milk ..	0·057—0·069	0·338—0·376
For each 1 lb. of 5.0 per cent. milk ..	0·060—0·073	0·362—0·402
For each 1 lb. of 5·5 per cent. milk ..	0·064—0·077	0·385—0·428
For each 1 lb. of 6·0 per cent. milk ..	0·067—0·081	0·409—0·454
For each 1 lb. of 6·5 per cent. milk ..	0·072—0·085	0·434—0·482
For each 1 lb. of 7·0 per cent. milk ..	0·074—0·089	0·454—0·505

Then upon this standard, a 1,000-lb. cow, yielding 25 lb. of milk of 3.5 per cent. fat, would require from a minimum amount of digestible crude protein $0.049 \times 25 = 1.225 + 0.7 = 1.925$ lb. to a maximum amount $0.061 \times 25 = 1.527 + 0.7 = 2.225$ lb.; and this cow would require from a minimum amount of total digestible nutrients $0.284 \times 25 = 7.1 + 7.925 = 15.025$ lb. to a maximum amount $0.316 \times 25 = 7.900 + 7.925 = 15.825$ lb.

Again, a 1,000-lb. cow, yielding 25 lb. of milk of 4.0 per cent. fat, would require from 2.05 lb. to 2.325 lb. digestible crude protein, and from 15.7 lb. to 17.57 lb. total digestible nutrients.

The term ''nutritive ratio'' means that amount of digestible protein that exists in a feed compared with the amount of non-nitrogenous digestible nutrients in that feed. As fat is capable of producing more heat when digested than the other nutrients, the fat content in the following rations has been multiplied by 2.3 and the product added to the amount of digestible carbohydrate and fibre—this total divided by the digestible protein gives the ''nutritive ratio'' of the ration. Thus in No. 1 ration there is one part of digestible protein to six parts of other digestible nutrients.

When considering rations for animals it must be understood that other factors, beside the digestible crude portein and total digestive nutrients supplied to the animal, must be taken into account, such as succulence, palatability, and variety of feeds.

Proteins are very complex bodies, and different proteins yield different substances when digested, and a number of these different substanes have to be supplied by the food for satisfactory nutrition. Therefore there is less chance of feeding an unbalanced protein content by using several feedstuffs, than by using only one or two.

Rations are useful guides in feeding, but it must be noted that the analyses of the feedstuffs from which they are computed are averages only—that is to say, the composition of the feedstuffs varies according to soil and climate wherein grown, and particularly to the age of growth when harvested.

The legumes, such as lucerne, cowpea, clover, &c., are characterised by the high amount of phosphorus and lime (particularly lime) they contain. Therefore, when animals graze on grass pastures growing upon soils deficient in phosphoric acid and lime, the inclusion of a legume in a ration is of particular value to these animals supplying both protein and mineral matter. Bran is also relatively rich in phosphorus.

There is in very many cases a deficiency of phosphoric acid in the pasture grazed by dairy stock. Where such deficiency occurs the rations should be supplemented by the addition of from 2 to 4 oz. of a mixture of finely ground Nauru phosphate and salt. The mixture is in the proportion of two parts by weight of finely ground Nauru phosphate to one part by weight of salt.*

Another consideration is the cost of a particular ration—whether it pays, when it is compared with the price obtained from the milk produced. But care should be taken that blame for unprofitable feeding is not placed upon the ration, when the fault is due to the cow. Some cows are capable of producing a large amount of milk, other cows are only capable of yielding a small amount of milk, even when supplied with ample well-balanced feed; such poor producers do not pay, and should be culled out from the herd.

RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK.

—	Dry Matter.	Digestible Nutrients. Crude Protein.	Fat.	Carbo-hydrates.	Fibre.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
1—							
40 lb. Green Sorghum ..	8·0	0·48	0·08	2·32	1·36		
60 lb. Mixed Pasture (average)	12·0	0·53	0·12	3·48	3·01		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
	27·4	2·25	0·25	8·02	5·04	15·5	1 ÷ 6·0
2—							
65 lb. Green Sorghum ..	13·0	0·78	0·13	3·76	2·14		
7 lb. Lucerne Chaff ..	6·4	1·08	0·04	1·95	0·58		
7 lb. Maize Meal	6·0	0·35	0·21	4·20	0·07		
	25·4	2·21	0·38	9·91	2·79	15·3	1 ÷ 6·1
3—							
45 lb. Green Sorghum ..	9·0	0·54	0·09	2·61	1·49		
13 lb. Wheat Chaff	11·3	0·27	0·12	3·39	2·04		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
2¾ lb. Cotton Seed Meal (decorticated)	2·5	0·96	0·17	0·54	0·06		
2 lb. Molasses	1·5	0·02	..	1·15	..		
	27·9	2·16	0·43	8·90	3·69	15·2	1 ÷ 6·2

* Finely-ground steamed Bone-meal can be used instead of Nauru phosphate.

RATIONS FOR DAIRY COWS—*continued.*

RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK—*continued.*

—	Dry Matter.	Digestible Nutrients. Crude Protein.	Fat.	Carbo-hydrates.	Fibre.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	Lb.	Lb.		
4—							
50 lb. Green Sorghum ..	10·0	0·60	0·10	2·90	1·70		
40 lb. Green Cowpea ..	8·8	0·64	0·12	2·92	1·14		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
1¾ lb. Cotton Seed Meal (decorticated)	1·6	0·61	0·11	0·34	0·03		
4 lb. Molasses	3·0	0·04	..	2·29	..		
	26·0	2·26	0·38	9·66	2·97	15·3	1 ÷ 5·5
5—							
42 lb. Sorghum Silage ..	10·7	0·38	0·08	3·06	2·06		
9 lb. Lucerne Chaff ..	8·3	1·39	0·06	2·49	0·75		
7 lb. Maize Meal	6·0	0·35	0·21	4·20	0·07		
	25·0	2·12	0·35	9·75	2·88	15·1	1 ÷ 6·3
6—							
35 lb. Sorghum Silage ..	8·9	0·31	0·07	2·55	1·71		
5 lb. Lucerne Chaff ..	4·6	0·77	0·03	1·38	0·42		
6 lb. Wheat Chaff	5·3	0·12	0·05	1·56	0·96		
2 lb. Linseed Oil Meal ..	1·8	0·44	0·15	0·63	0·09		
3 lb. Pollard	2·7	0·41	0·09	1·62	0·06		
3 lb. Rice Meal	2·7	0·20	0·28	1·50	0·06		
	26·0	2·25	0·67	9·24	3·30	15·5	1 ÷ 6·2
7—							
65 lb. Green Maize ..	11·7	0·65	0·19	3·90	2·01		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
7 lb. Maize Meal	6·0	0·35	0·21	4·20	0·07		
	25·1	2·24	0·45	10·32	2·75	15·7	1¼ ÷ 6·3
8—							
54 lb. Green Maize ..	9·7	0·54	0·16	3·24	1·67		
10 lb. Wheat Chaff	8·7	0·21	0·09	2·61	1·57		
3 lb. Maize Meal	2·6	0·15	0·09	1·80	0·03		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
2¾ lb. Cotton Seed Meal (decorticated)	2·5	0·96	0·17	0·54	0·06		
	26·1	2·23	0·56	9·40	3·43	5·6	1 ÷ 6·3
9—							
30 lb. Maize Silage	9·0	0·30	0·09	3·21	1·56		
5 lb. Good Bush Hay ..	4·6	0·14	0·03	1·20	1·13		
4 lb. Cowpea Chaff ..	3·6	0·45	0·07	0·76	0·54		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
3 lb. Cocoanut Cake ..	2·6	0·40	0·21	1·19	0·20		
1 lb. Blood Meal	0·9	0·67	0·01	0·05	..		
	25·1	2·21	0·56	9·41	3·48	15·6	1 ÷ 6·4

RATIONS FOR DAIRY COWS—*continued.*

RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK—*continued.*

—	Dry Matter.	Digestible Nutrients. Crude Protein.	Fat.	Carbo-hydrates.	Fibre.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
10—							
35 lb. Maize Silage ..	10·5	0·35	0·10	3·75	1·82		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
7 lb. Barley Meal	6·2	0·65	0·06	4·27	0·21		
	24·1	2·24	0·21	10·24	2·70	15·4	1 ÷ 6·0
11—							
80 lb. Green Paspalum ..	20·0	1·20	0·16	5·60	4·96		
6 lb. Lucerne Chaff ..	5·5	0·93	0·04	1·67	0·50		
	25·5	2·13	0·20	7·27	5·46	15·0	1 ÷ 1·6
12—							
67 lb. Green Paspalum ..	16·5	1·00	0·13	4·69	4·15		
3 lb. Maize Meal	2·6	0·15	0·09	1·80	0·03		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
2 lb. Cotton Seed Meal (decorticated)	1·8	0·70	0·13	0·39	0·04		
	23·5	2·22	0·40	8·09	4·32	15·0	1 ÷ 6·0
13—							
100 lb. Sudan Grass	22·0	1·50	0·10	7·50	3·80		
4½ lb. Lucerne Chaff ..	4·1	0·70	0·03	1·25	0·37		
	26·1	2·20	0·13	8·75	4·17	15·3	1 ÷ 6·0
14—							
100 lb. Sudan Grass	22·0	1·50	0·10	7·50	3·80		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
1 lb. Cotton Seed Meal (decorticated)	0·9	0·35	0·07	0·19	0·02		
	25·5	2·22	0·22	8·90	3·92	15·3	1 ÷ 6·0
15—							
50 lb. Sudan Grass	11·0	0·75	0·05	3·75	1·90		
8 lb. Wheat Chaff	7·0	0·16	0·07	2·09	1·29		
4 lb. Lucerne Chaff ..	3·7	0·62	0·02	1·11	0·33		
3 lb. Maize Meal	2·6	0·15	0·09	1·80	0·03		
2 lb. Linseed Oil Meal ..	1·8	0·44	0·15	0·63	0·09		
	26·1	2·12	0·38	9·38	3·64	15·5	1 ÷ 6·5
16—							
20 lb. Green Oats	4·6	0·28	0·08	1·30	0·98		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
10 lb. Wheat Chaff	8·8	0·21	0·09	2·61	1·61		
3 lb. Cocoanut Cake ..	2·6	0·40	0·22	1·19	0·20		
3 lb. Molasses	2·3	0·03	..	1·72	..		
	25·7	2·16	0·45	9·04	3·46	15·1	1 ÷ 6·3

RATIONS FOR DAIRY COWS—*continued.*

RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK—*continued.*

—	Dry Matter.	Digestible Nutrients. Crude Protein.	Fat.	Carbo-hydrates.	Fibre	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
17—							
25 lb. Green Barley	5·2	0·45	0·10	1·50	1·07		
13 lb. Wheat Chaff	11·4	0·27	0·11	3·40	2·10		
6 lb. Lucerne Chaff . .	5·5	0·93	0·04	1·67	0·50		
2 lb. Linseed Oil Meal . .	1·8	0·44	0·15	0·63	0·09		
3 lb. Molasses	2·3	0·03	. .	1·72	. .		
	26·2	2·12	0·40	8·92	3·76	15·2	1 ÷ 6·4
18—							
60 lb. Sugar-cane Tops . .	16·8	1·02	0·18	5·64	3·90		
10 lb. Cowpea Chaff . .	9·2	1·12	0·19	1·90	1·35		
	26·0	2·12	0·37	7·54	5·25	15·3	1 ÷ 6·4
19—							
50 lb. Sugar-cane Tops . .	14·0	0·85	0·15	4·70	3·25		
30 lb. Green Cowpea . .	6·6	0·48	0·09	2·19	0·84		
5 lb. Lucerne Chaff . .	4·6	0·77	0·04	1·38	0·42		
	25·2	2·10	0·28	8·27	4·51	15·2	1 ÷ 6·3
20—							
35 lb. Elephant Grass . .	7·0	0·32	0·07	2·03	1·75		
35 lb. Imphee	7·0	0·42	0·07	2·03	1·15		
8 lb. Lucerne Chaff . .	7·4	1·24	0·05	2·22	0·67		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
	25·8	2·23	0·34	9·28	3·62	15·5	1 ÷ 6·1
21—							
35 lb. Elephant Grass . .	7·0	0·32	0·07	2·03	1·75		
35 lb. Imphee	7·0	0·42	0·07	2·03	1·15		
10 lb. Pumpkins	1·7	0·15	0·06	0·80	0·16		
7 lb. Lucerne Chaff . .	6·4	1·08	0·04	1·95	0·58		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
	26·5	2·22	0·39	9·81	3·69	16·1	1 ÷ 6·4
22—							
65 lb. Mixed Pasture (average)	13·0	0·57	0·13	3·77	3·26		
9 lb. Lucerne Chaff . .	8·3	1·39	0·05	2·50	0·75		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
	25·7	2·21	0·33	9·27	4·06	15·8	1 ÷ 6·3
23—							
15 lb. Poor Bush Hay . .	14·0	0·21	0·08	2·77	3·03		
10 lb. Pumpkins	1·7	0·15	0·06	0·80	0·16		
5 lb. Lucerne Chaff . .	4·6	0·77	0·03	1·38	0·42		
7 lb. Maize Meal	6·1	0·35	0·21	4·20	0·07		
1 lb. Blood Meal	0·8	0·66	0·02	0·06	. .		
	27·2	2·14	0·40	9·21	3·68	15·4	1 ÷ 6·4
24—							
65 lb. Prairie Grass . .	15·1	1·95	0·26	4·29	2·75		
5 lb. Wheat Chaff	4·4	0·10	0·04	1·30	0·80		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
1 lb. Molasses	0·7	0·01	. .	0·57	. .		
	24·6	2·31	0·45	9·16	3·60	15·5	1 ÷ 5·9

It has been mentioned before that better results are obtained from rations composed of a variety of feed ingredients than from a ration made up with only one or two feedstuffs.

A very convenient method is to have on hand a quantity of the concentrates already mixed, and then to feed a certain quantity of this mixture with the roughage that is being used, increasing the quantity of the mixture used until it is noticed that no further increased milk production is obtained. An example of this procedure has been published in the ''Live Stock Bulletin'' under the heading of ''4-2-1'' plan; this meaning that a concentrate mixture is made of four parts maize meal, two parts ground oats, and one part linseed meal. The above mentioned paper recommends the following:—3 lb. of silage and 1 lb. of legume hay for every 100 lb. of the animal's body weight, and to gradually increase the amount given of the concentrate mixture until the cow is getting 1 lb. for every 5 lb. of milk produced. Thus a 1,000-lb. cow, yielding 25 lb. of milk, would be given a ration of 30 lb. maize silage, 10 lb. lucerne hay, and 5 lb. of the concentrate mixture—containing 2.26 lb. digestible crude protein and 13.6 lb. total digestible nutrients. This ration has the amount of digestible crude protein required by the Henry and Morrison standard, but has a somewhat lower amount of total digestible nutrients. Other concentrates can be used in this convenient manner.

For instance, a concentrate mixture could be prepared by mixing eight parts maize meal, one part bran, and one part cotton seed meal. This mixture would have the following composition:—

—	Dry Matter.	Digestible. Crude Protein.	Digestible. Fat.	Digestible. Carbo-hydrates.	Digestible. Fibre.
	Lb.	Lb.	Lb.	Lb.	Lb.
1 lb. Concentrate Mixture	0·87	0·088	0·032	0·539	0·014
5 lb. Concentrate Mixture	4·3	0·44	0·16	2·69	0·07

If 4 lb. maize silage and 1 lb. lucerne chaff be used for every 100 lb. live weight, and 1 lb. of the above concentrate mixture for every 5 lb. of milk produced, the following will be the ration for a 1,000 lb. cow yielding 25 lb. of milk:—

—	Dry Matter.	Digestible. Crude Protein.	Digestible. Fat.	Digestible. Carbo-hydrates.	Digestible. Fibre.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
40 lb. Maize Silage	12·0	0·40	0·12	4·27	2·08		
10 lb. Lucerne Chaff	9·2	1·55	0·07	2·77	0·84		
5 lb. Concentrate Mixture ..	4·3	0·44	0·16	2·69	0·07		
	25·5	2·39	0·35	9·73	2·99	15·5	1 ÷ 5·6

The amount of digestible crude protein is a little higher in this ration than is required by the standard.

The following extracts from the ''Agricultural Gazette'' of New South Wales, December, 1927, are given as an illustration of what complete feeding, when combined with high milk-producing power, can accomplish:—

''On 15th October, 1927, Wagga Gladys, the seven-year old Jersey cow of the Hawkesbury Agricultural College herd, completed 365 days' official test for a yield of 20,835 lb. milk, with an average test of 5.52 per cent. and 1,149,385 lb. butter fat, which is equivalent to 1,384.8 lb. commercial butter. This is an official world's record for both milk and butter fat production for the Jersey breed. It was achieved on twice-a-day milking, whereas all the great records in other countries have been made on three and four milkings a day. Wagga Gladys calved on 9th November, 1926, and on the day of her last periodical test she yielded 53.5 lb. milk and 3.694 lb. butter fat in twenty-four hours.''

The following is extracted from the "Agricultural Gazette" of New South Wales, October, 1927, and shows the ration fed to Wagga Gladys, together with the record of her 273 days' performance:—

"On her present lactations as a seven-year-old, which is still in progress, she has produced for the first nine-months period 15,951 lb. milk, of 5.3 per cent. test, 839,814 lb. butter fat, being equal to 1,011.8 lb. commercial butter. . . . . On the hypothesis that feeding must be linked with breeding to secure high production, an indication of the ration fed to Wagga Gladys may be given.

"*Concentrates.*—The following mixture was fed daily at the rate of 1 lb. to every 3½ lb. milk produced:—300 lb. maize meal, 200 lb. bran, 100 lb. crushed oats, 50 lb. linseed meal. During March and April the mixture was altered by the substitution of 25 lb. cotton seed meal for 25 lb. of the linseed meal.

"*Bulk Ration.*—The daily bulk ration consisted of:—25 lb. maize silage, 10 lb. lucerne chaff (of poor quality during May), 3 lb. bran, and 1½ lb. linseed meal. During March and April half the linseed meal was replaced by an equal amount of cotton seed meal. During the latter half of the month of March the silage was replaced by an equal amount of green corn stalks chaffed.

"*Grazing.*—The pastures were very poor, except after the Easter rain. In December, Wagga Gladys was grazed on a poor stand of green lucerne for two days prior to test. In January, she was grazed on green lucerne for two hours daily for a week previous to test. In February, March, and April, she was grazed on green lucerne for two hours daily, and in May and June for one hour daily. In July, green oats were given for a week previous to the test; Gladys and the whole herd went off in butter fat yield this month, and the green oats were blamed. In August, she was grazed on green lucerne for two hours daily."

It will be interesting to compare the abovementioned cow's milk production and her feeding with the standard used in computing the examples of rations previously given. The weight of Wagga Gladys is not known, and though it may not be 1,000 lb. live weight, this figure will be used for the sake of comparison.

The cow produced 15,951 lb. milk in 273 days—that is, 58.4 lb. of milk per day, of 5.3 per cent. fat. Using the minimum requirements of the standard, the cow should receive 4.32 lb. digestible crude protein and 29.7 total digestible nutrients.

The cow produced on an average 58.4 lb. of milk per day, and it is stated that for every 3½ lb. of milk produced 1 lb. of the mixed concentrate was given; therefore, 16.6 lb. mixed concentrate was fed daily. The following is the total ration fed:—

—	Dry Matter.	Digestible Nutrients. Crude Protein.	Fat.	Carbo-hydrates.	Fibre.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
Bulk Ration—							
25 lb. Maize Ensilage ..	7·5	0·25	0·07	2·67	1·30		
10 lb. Lucerne Chaff ..	9·2	1·55	0·07	2·77	0·84		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
1·5 lb. Linseed Meal ..	1·3	0·33	0·11	0·47	0·06		
16·6 lb. Mixed Concentrate	14·6	1·50	0·52	8·20	0·37		
	35·2	4·00	0·82	15·32	2·67	22·8	1 ÷ 4·9
Allowing 10 lb. Green Lucerne for one hour's grazing ..	2·4	0·32	0·04	0·63	0·29		
	37·6	4·32	0·86	15·95	2·96	24·0	1 ÷ 4·8
Or— Allowing 20 lb. Green Lucerne for two hours' grazing ..	4·8	0·64	0·08	1·26	0·58		
	40·0	4·64	0·90	16·58	3·25	25·4	1 ÷ 4·7

It will be seen that the digestible crude protein, 4.32 lb., agrees with that required by the standard, and that the amount of total digestible nutrients of this ration is somewhat lower.

PRODUCTION RECORDING.

List of cows officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of The Australian Illawarra Shorthorn Society, The Jersey Cattle Society, The Ayrshire Herdbook of Queensland, and the Friesian Herd Book of Australia. The final tests of these cows were carried out during the months of May and June, 1931 (273 days' period unless otherwise stated.)

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
		JERSEY.		
Lady Dorothy of Carlton	Mature	12,009·597	649·861	J. Collins, Tingoora
Trecarne Duchess	Mature	9,534	551·779	T. A. Petherick, Lockyer
Melrose Countess	Mature	7,806·75	434·467	J. W. Evans, Boonah
Oxford Mousie	Mature	8,214	428·588	G. S. Beckett, Boonah
Trinity Hazelette	Mature	7,996·25	422·052	J. Sinnamon and Sons, Moggill
Sultans Rosella of Brooklands	Mature	7,797·169	387·645	T. A. Petherick, Lockyer
Duchess of Woodlands	Senior (4 years)	7,863·125	365·516	D. R. Hutton, Cunningham
Trecarne Rosella	Junior (4 years)	7,154·873	469·848	T. A. Petherick, Lockyer
Trinity Bubbles	Junior (4 years)	8,749·25	421·434	J. Sinnamon and Sons, Moggill
Trecarne Tottie 4th	Junior (4 years)	5,844·9	382·761	H. Mear, Maleny
Pansy of Woodlands	Senior (3 years)	8,250·375	383·687	D. R. Hutton, Cunningham
Yimmin Crystal	Senior (3 years)	6,198·9	323·441	Burton and Co., Yandina
Viscounts Milkmaid of Woodbine	Senior (3 years)	5,539·25	294·307	F. P. Fowler and Sons, Coalstoun Lakes
Trinity Gloria	Junior (3 years)	7,766·375	431·492	J. Sinnamon and Sons, Moggill
Ruby of Carlton	Junior (3 years)	7,919·933	395·639	J. Collins, Tingoora
Trecarne Locket	Junior (3 years)	5,995·821	328·788	T. A. Petherick, Lockyer
Sweet Zinnie of Chelsford	Junior (3 years)	5,134·075	282·402	G. A. Ferguson, Woodhill
Gleam of Ipsley (300 days)	Senior (2 years)	6,278·5	385·493	J. A. Rudd, Corinda
Dot of Ipsley	Senior (2 years)	6,139·825	364·598	J. A. Rudd, Corinda
Princess 3rd of Ferndale	Senior (2 years)	6,642·125	332·794	D. R. Hutton, Cunningham
Oxford Palatine Dot	Senior (2 years)	4,755·05	295·428	V. Goodger, Nanango
Baby of Burnleigh	Senior (2 years)	5,656·85	292·461	W. W. Mallett, Nambour
Trecarne Flora 3rd	Senior (2 years)	5,317·785	289·505	T. A. Petherick, Lockyer
Abbeystead Pride	Senior (2 years)	5,864·632	281·202	J. C. Davey, Gatton
Primrose of Burnleigh	Senior (2 years)	4,273·75	255·885	C. F. Klaus, Mundubbera
Trinity Meadowsweet	Junior (2 years)	6,478·125	385·043	J. Sinnamon and Sons, Moggill
Trinity Augustine	Junior (2 years)	6,828·125	379·702	J. Sinnamon and Sons, Moggill
Trinity Crystal	Junior (2 years)	6,907·125	350·929	J. Sinnamon and Sons, Moggill
Pineview Model	Junior (2 years)	5,847·05	343·925	J. Hunter and Sons, Borallon
Trinity Dreamaway	Junior (2 years)	6,547·625	331·863	J. Sinnamon and Sons, Moggill
Una of Wavemere	Junior (2 years)	5,302·25	330·44	Mrs. L. M. Dahl, Taragoola
Mayflower of Lisieux	Junior (2 years)	5,866·853	321·09	J. Williams, Greenview
Trinity Harmony	Junior (2 years)	6,033	320·381	J. Sinnamon and Sons, Moggill
Melody of Rosehill	Junior (2 years)	5,273	306·283	T. Gillespie, Ravenshoe
Charm of Burnleigh	Junior (2 years)	4,826·05	281·325	W. W. Mallett, Nambour
Kenmore Peacetime	Junior (2 years)	5,546·425	278·254	E. L. Melville, Toogoolawah
Girlies Fair Luck of Highthorn	Junior (2 years)	4,936·4	273·406	J. F. Teske, Nambour
Trecarne Tottie 5th	Junior (2 years)	3,504·123	268·502	T. A. Petherick, Lockyer
Blue Belle of Burnleigh	Junior (2 years)	4,688·15	251·936	W. W. Mallett, Nambour
Trecarne Rosebud	Junior (2 years)	4,197·961	232·444	T. A. Petherick, Lockyer
		AUSTRALIAN ILLAWARRA SHORTHORN.		
Foremost of Blacklands	Mature	16,193·296	615·543	A. Pickels, Wondai
Roan 4th of Oakvilla	Mature	11,562·458	460·634	W. Marquardt, Wondai
Betty 2nd of Iroquois	Mature	9,680·667	427·795	H. Welch, Proston
Maggie 3rd of Rockleigh	Mature	9,125·601	418·153	T. Strain, Wondai
Ready of Bri Bri	Mature	10,064	389·513	W. Middleton, Cambooya
Pet of Hill Top	Mature	9,293·272	381·679	J. A. Heading, Cloyna
Maisy of Nestles	Mature	9,378·45	367·511	C. Francis, Biarra
Poppy of Hill Top	Mature	11,111·291	365·674	J. A. Bradley, Goomeri
Daly of Rhodesview	Mature	9,998·121	357·289	W. Gierkie and Sons, Helidon
Princess of Rockleigh	Mature	8,639·216	351·355	T. Strain, Wondai
Nancy of Hill Top	Mature	9,346·53	377·666	J. A. Heading, Cloyna
Cherry 7th of Rosemount	Senior (4 years)	9,875·05	385·45	A. J. Bryce, Maleny
Doreen 9th of Rosemount	Senior (4 years)	8,514·05	345·413	A. J. Bryce, Maleny
Red Plum 7th of Springdale	Senior (4 years)	9,955·5	335·276	T. Shuttlewood, Peachester
Duchess of Wadevale	Junior (4 years)	11,632·3	593·361	J. Wade, Kilcoy
Topsy of Waverley	Junior (4 years)	11,553	427·462	V. Dunstan, Wolvi
Stella 6th of White Park	Junior (4 years)	9,491·875	371·148	W. T. Savage, Barnesmore
Princess II. of White Park	Junior (4 years)	7,943·75	341·665	W. T. Savage, Barnesmore
Model 17th of Springdale	Junior (4 years)	9,922·2	331·72	T. Shuutlewood, Peachester
Pansy of Corunna	Junior (4 years)	8,132·5	310·03	C. O'Sullivan, Ascot Factory
Lady Sal IX. of Cedar Grove	Senior (3 years)	8,177·85	380·813	A. C. Stewart, Gympie
Rosebud 9th of Rosenthal	Senior (3 years)	8,863	357·996	S. Mitchell, Rosenthal
Charm 2nd of Wilga Vale	Senior (3 years)	9,261·625	346·086	C. O'Sullivan, Ascot Factory
Peggy of Glenrock	Senior (3 years)	9,025·125	319·237	A. Kamholtz, Nerang
Alice 14th of Kingsdale	Senior (3 years)	7,708·8	311·368	A. A. King, Mooloolah
Empress 5th of Lemon Grove	Junior (3 years)	10,076·95	398·589	Mrs. A. M. Bowman, Kin Kin
Rose Marie of Dnalwon	Junior (3 years)	7,337·123	276·994	A. J. Caswell, Wangalpong

PRODUCTION RECORDING—*continued.*

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS—*continued.*				
Princess 2nd of Headlands	Senior (2 years)	10,345·286	424·987	J. A. Heading, Cloyna
Scarlet XII. of Springdale	Senior (2 years)	10,051·05	390·212	V. Dunstan, Wolvi
Beauty 15th of Fairlie	Senior (2 years)	8,950·75	382·111	C. B. Mitchell, Warwick
Dahlia 7th of Springdale	Senior (2 years)	10,058·275	379·215	A. J. Caswell, Wangalpong
Butterfly of Trevor Hill	Senior (2 years)	8,742·25	371·803	G. Gwynne, Umbiram
Favourite of Doctor's Creek	Senior (2 years)	8,477·6	344·832	A. E. Vohland, Aubigny
Lovely 10th of Greyleigh	Senior (2 years)	8,729·3	327·146	W. H. Thompson, Nanango
Blossom 4th of The Cedars	Senior (2 years)	8,885·181	299·213	M. C. Lester, Laidley Creek
Dulcie 9th of Kingsdale	Senior (2 years)	7,207·05	287·32	A. A. King, Mooloolah
Doreen 14th of Rosemount	Senior (2 years)	6,887·95	277·471	A. J. Bryce, Maleny
Alice 19th of Kingsdale	Senior (2 years)	6,442·55	259·342	A. A. King, Mooloolah
Susie 5th of Nestlebrae	Senior (2 years)	7,347·45	255·163	A. A. King, Mooloolah
Dairymaid of Dnalwon	Junior (2 years)	9,020	363·903	E. F. Thompson, Tallebudgera
Olive 12th of Cedar Grove	Junior (2 years)	9,032·5	335·305	C. O'Sullivan, Greenmount
Fluff of Dnalwon	Junior (2 years)	8,270·75	318·993	R. L. Harrison, Gleneagle
Sunflower of Green Hill	Junior (2 years)	8,707·478	310·349	J. W. Johnston, Wooroolin
Venus 6th of Euroa	Junior (2 years)	7,542	296·693	H. F. Lindenmayer, Mundubbera
Duchess 4th of Homelea (272 days)	Junior (2 years)	6,938	280·937	J. Savage, Humphrey
Mayflower 11th of Parkview	Junior (2 years)	6,944·625	256·480	Queensland Agricultural High School and College, Gatton
Gentle 2nd of Mountain Home	Junior (2 years)	6,934·505	246·728	M. C. Lester, Laidley Creek
Floss of Parkview	Junior (2 years)	4,276·693	240·52	Queensland Agricultural High School and College, Gatton
College Fussy	Junior (2 years)	6,203·434	231·443	Queensland Agricultural High School and College, Gatton
FRIESIAN.				
Dot II. of Oaklands	Mature	10,878·267	403·693	W. Richters, Tingoora
Dairymaid II. of Oaklands	Mature	10,032·157	381·546	W. Richters, Tingoora
Stoneybrae Belle	Junior (2 years)	11,155·5	411·935	Hickey and Sons, Wilston
Glendalough Queen	Senior (2 years)	11,053	381·264	Hickey and Sons, Wilston
Oaklands Rock Girl	Junior (3 years)	8,596·469	319·567	W. Richters, Tingoora
AYRSHIRES.				
Fairview Orphan Girl	Mature	11,519·925	424·115	J. H. and R. Anderson, Southbrook
Longlands Fuschia	Mature	9,903·6	382·19	T. Holmes, Yarranlea
Fairview Pride	Junior (4 years)	8,028·45	348·114	J. H. and R. Anderson, Southbrook
Fairview Lady Jean	Junior (4 years)	7,793·975	328·083	J. H. and R. Anderson, Southbrook
Benbecula Thelma	Junior (3 years)	9,668·45	375·427	T. Holmes, Yarranlea
Longlands Tina VII.	Junior (3 years)	9,053·6	312·999	T. Holmes, Yarranlea
Benbecula Berry	Junior (3 years)	7,664·9	288·005	T. Holmes, Yarranlea
Benbecula Laurel	Senior (2 years)	7,173·7	250·954	T. Holmes, Yarranlea

List of cows, officially tested by officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Book of The Australian Illawarra Shorthorn Society, The Jersey Cattle Society, The Friesian Cattle Society of Australia, and The Ayrshire Cattle Society. Production charts for which were compiled during the months of September and to the 20th October, 1931 (273 days' period unless otherwise stated).

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
Glenlee Moreen	Mature	11,077·4	476·106	R. Martin, Coulstoun Lakes
Fanny 3rd of Rhodesview	Mature	9,564·882	352·047	W. Gierkie and Sons, Helidon
Redwing 10th of Strathobi	Senior (4 years)	9,604·85	354·135	A. C. Stewart, Kin Kin
Duchess 5th of Beechwood	Senior (3 years)	7,977·55	331·463	A. Marks, Atherton
Carnation of Trevor Hill	Junior (3 years)	7,908·374	327·981	G. Gywnne, Southbrook
Dove 13th of Rosenthal	Junior (3 years)	7,854·75	327·348	S. Mitchell, Warwick
Rosetta 14th of Burradale	Senior (2 years)	9,832·625	393·764	W. F. Kajewski, Glencoe
Angeline 3rd of Bri Bri (268 days)	Senior (2 years)	7,004·6	359·094	W. Middleton, Cambooya

PRODUCTION RECORDING—*continued.*

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS—*continued.*				
Fuschia 8th of Rosenthal ..	Senior (2 years)	7,426·375	297·66	S. Mitchell, Warwick
Persia 4th of Rosenthal ..	Senior (2 years)	7,115·5	292·981	S. Mitchell, Warwick
Tiny 3rd of Rhodesview ..	Senior (2 years)	8,065·63	289·356	W. Gierkie and Sons, Helidon
Minnie of Happy Valley ..	Senior (2 years)	6,255·35	277·743	R. Martin, Coalstoun Lakes
Kittie 2nd of Kingsdale ..	Senior (2 years)	6,490·95	277·066	A. A. King, Mooloolah
Blossom 2nd of Oakvilla ..	Junior (2 years)	9,246·914	361·148	H. Marquardt, Wondai
Chance of Wandegong ..	Junior (2 years)	8,676·25	345·549	F. D. Lindenmayer, Mundubbera
Mavis of Thornhill (262 days)	Junior (2 years)	7,054	292·384	R. Chalmers, Mundubbera
Princess of Wandegong ..	Junior (2 years)	7,030·25	290·926	G. D. Lindenmayer, Mundubbera
Velvet of Trevor Hill ..	Junior (2 years)	6,822·7	283·949	G. Gwynne, Southbrook
Queenie 8th of Rhodesview ..	Junior (2 years)	6,925·965	277·758	W. Gierkie and Son, Helidon
Fuschia of Trevor Hill ..	Junior (2 years)	6,667·7	271·026	G. Gwynne, Southbrook
College Wonga	Junior (2 years)	5,573·038	242·587	Queensland Agricultural High School and College, Gatton
College Stately	Junior (2 years)	5,221·5	233·8	Queensland Agricultural High School and College, Gatton
JERSEY.				
Trinity Royal Rosie	Mature ..	8,332·875	447·204	J. Sinnamon and Sons, Moggill
Jerseymaid of Burnleigh ..	Mature ..	6,430·3	424·833	R. A. Anderson, Yandina
Treasure of Burnleigh ..	Junior (4 years)	6,921·05	341·757	W. W. Mallett, Nambour
Carnation Charm's Star ..	Junior (3 years)	6,070·75	340·824	H. Neil, Brassall
Yimmin Queen	Senior (2 years)	5,750·7	331·942	Burton and Sons, Yandina
Peerless of Southport ..	Junior (2 years)	7,489·512	373·377	J. Collins, Tingoora
Desert Maid of Brooklands ..	Junior (2 years)	7,093·226	365·601	J. Williams, Wondai
Trinity National Lady ..	Junior (2 years)	6,630·75	346·03	J. Sinnamon and Sons, Moggill
Majesty's Joan of Brooklands	Junior (2 years)	6,493·092	296·084	J. Williams, Wondai
Glenview Skylight	Junior (2 years)	4,810	270·134	F. P. Fowler and Sons, Coalstoun Lakes
Gladness of Hamilton ..	Junior (2 years)	4,044·75	240·868	J. W. Evans, Boonah
Goldfinder's Honeysuckle of Morago	Junior (2 years)	4,259·5	234·755	J. W. Evans, Boonah
FRIESIAN.				
Stella Rock of Oaklands ..	Junior (2 years)	8,271·227	298·261	W. Richters, Tingoora
Rock Maid of Oaklands ..	Junior (2 years)	7,601·135	286·571	W. Richters, Tingoora
Fanny Rock of Oaklands ..	Junior (2 years)	7,224·227	276·357	W. Richters, Tingoora
AYRSHIRE.				
Crescent Farm Beryl's Pride (261 days)	Mature ..	11,271·515	437·196	J. C. Mann, Yarranlea
Crescent Farm Choice.. ..	Senior (3 years)	9,428·998	361·823	J. C. Mann, Yarranlea
Crescent Farm Vixen	Junior (2 years)	9,486·08	382,672	J. C. Mann, Yarranlea

TRYPAN BLUE.

A SPECIFIC FOR BUSH TICK PARALYSIS.

Where scrub or bush ticks are suspected as being responsible for paralysis in pigs, it is recommended that, particularly in the case of valuable animals and where scrub ticks are prevalent, the animals should be thoroughly examined every second or third day, as it has been stated that these ticks do not harm the animals during the first four days of attachment.

It has been proved that trypan blue, injected under the skin is a specific (or a suitable remedy) for this disease in the dog, for under careful treatment, the paralysis soon improves and in a few days the animal thoroughly recovers, one dose of the trypan blue usually being sufficient.

Preparation of Solution.—A 2 per cent. solution (about nine grains to the fluid ounce) is made by dissolving the trypan blue in boiling water, a sediment falling as the solution cools, and this should be removed by filtering through a funnel in which a properly folded filter paper is placed, or a fine piece of clean linen which has been previously boiled. The hypodermic syringe and needle, necessary in this form of treatment, before being used should be placed in a vessel containing cold water, then placed over the fire and the water boiled for ten minutes; this to thoroughly sterilize the syringe and needle which is now ready for use when the solution to be injected has cooled.

The injection can be made anywhere under the skin, but the best positions are either in the front of the chest or behind the shoulder, the skin in these positions being loose a fold of which is easily caught up by the fingers of the left hand, whilst the needle is inserted with the right hand. It is advisable to clip off the hair and disinfect the spot chosen before introducing the needle.

A dose for dogs, according to age and size, varies from 1 to 5 drachms, or 1 to 5 teaspoonfuls; the dose for calves, foals, and pigs according to age and size from ½ ounce to 2½ ounces or 1 to 5 tablespoonsful.

In general it would be preferable for the pig-raiser to have the solution prepared by a chemist to ensure accuracy of preparation and dosage.

ERADICATION OF DISEASE AMONG PIGS.

By J. A. RUDD, L.V.Sc., Department of Agriculture and Stock, Brisbane.

THE eradication of tuberculosis and other diseases in pigs is not difficult if certain very definite lines are followed to that end. The question arises: How does the pig become infected? It is undoubtedly manifest that there are several channels through which infection may be carried to the pig.

(1) Through transmission from parent to offspring.
(2) From milk and other dairy slops.
(3) The use of insanitary feeding troughs and general unclean condition of sties, and faulty methods of construction of sties so that it is a matter of impossibility to keep them clean and wholesome.

Hereditary Transmission.

Transmission from parent to offspring although possible is not a very constant source of infection, and may be dismissed with the observation that all things being equal there is in reality very little chance of infection from this source.

The Bucket.

Milk and other dairy slops are one of the chief sources of infection. Dairy cows all the world over suffer from tuberculosis. At least 2 per cent. of the cows of most herds are liable to spread infection through their milk supply, i.e., they have or are affected with tuberculosis of the udder, and unless this 2 per cent. at least are eliminated the chances of infection are very great. The elimination of this 2 per cent. is not a difficult matter, and it only requires the exercise of a certain amount of intelligence in order to do this successfully. Assuming that this 2 per cent. cannot for various reasons be cut out of the active list of the herd, the other method is to cook the skim milk before feeding it to the pigs. Raising a temperature of 155 deg. Fahr. for fifteen minutes will do all that is required, and not only the pigs but also calves will have the added advantage of being fed on milk which is not only very wholesome but absolutely free from disease. This is not a big undertaking and should be carried out purely as a routine practice, as it eliminates the germs of contagious mastitis, tuberculosis, and contagious abortion in one hit, and also a great many of the so-called diseases of young calves which are largely due to unclean methods of milking and treatment of milk after separation of the cream from the skim milk. The return as a result of immunity from disease will more than repay the added cost of the additional work necessary in order to insure immunity among the small immature stock on the farm.

Filth.

The use of insanitary feeding troughs and general unclean condition of sties and faulty methods of construction of sties make it a matter of impossibility to keep them clean and wholesome.

It is possible to obtain a culture of bovine tuberculosis and other bacilli from the cracks in the end of wooden feeding troughs. If these cracks or crevices are capable of holding such filth it is clearly an impossibility to breed healthy pigs.

If wooden troughs are an absolute necessity, then why not fill up the cracks and crevices with cement and clean them once every week with a strong solution of washing soda? There are certain woods which do not split and crack easily, such, for instance, as the mahogany which, although it will not stand in the ground, is

used largely for piles in rivers where borers are prevalent. The erection of suitable pens with impervious concrete floors are an absolute necessity if disease is to be held in check.

The insanitary condition of pig pens. From their construction one is led to think that sanitation was not considered necessary and did not enter into the calculation of those who are responsible for such death traps. Slabbed floors raised off the ground through which excreta and products of decomposing vegetable and animal matter percolates on to the ground below and accumulating there for years is a common spectacle on most pig farms. The pig is securely enclosed in this sty, meticulous care being taken to make sure that all avenues of likely escape from such evil looking and filthy surroundings are completely cut off, with the result that he has to live his normal life surrounded on all sides by a cesspool of iniquitous fermenting filth, the gases from which escaping continuously not only make life a perfect nightmare but must of necessity breed disease, the result of which is only discovered when the returns from the factory disclose the fact. This specious form of cruelty should be discontinued if healthy pigs are to be bred, both for pleasure and for profit.

The Normal Pig.

Given healthy surroundings the pig is normally a hardy, thrifty animal and one that can be depended on easily to make the greatest profit out of the poorest food in comparison with other farm animals.

Breeding from healthy stock which are not inbred does help not only in early maturity but in keeping down disease. The pig is one of the few animals that will not stand inbreeding and whose constitution quickly resents any tricks in this direction. Breeding from immature stock, and this also includes promiscuous breeding, is a factor which cannot be too lightly regarded if success is to be assured in the breeding of pigs for profit.

Selection in Breeding.

The selection of breeding stock is not always attended to with the care that is necessary to guard against predisposition to disease. Knocked-kneed, swampy backed boars and sows of similar conformation with the additional defect that they are down on their pins (i.e., weak fetlocks) are commonly seen among the breding stock, with the result that these animals can easily be responsible for a great many of the ills attendant on immature young stock. "Like begets like" is one of the fundamental principles of breeding. This is a golden rule and is generally well known, but it is more often accepted and carried out in the breach than in the observance. So much depends also on the feeding of the parents not only after the pigs are born and still sucking their mother but before there is even a thought of breeding from her. The feeding of the boar is likewise as important, and neglect in this regard is responsible for so many failures—80 per cent. of the partial paralysis of pigs is bred into them by unsuitable mating of faulty parents and with such faults as are easily seen and could be quickly corrected by sterilisation of the unfit. If this was a difficult matter it might easily be overlooked, but as it is one of the everyday operations on the farm lack of care may easily account for a good deal of latent trouble, which manifests itself as time goes on, and the price paid for such neglect is altogether out of all proportion and makes all the difference betwen profit and loss. There is still another matter which is suggested for serious consideration, and that is the methods which may be adopted with the object of ridding the herd of the 2 per cent. cows which are in most herds and are infected with tuberculosis of the udder.

Getting Rid of the Two Per Centers.

Vaccination of all cows which have mammitis and the elimination of such cows which will not respond to treatment with vaccine, i.e., such cows as will not respond to treatment with vaccine even in as large doses as 20 cc. per day (the treatment starting with 5 c.c. of vaccine as first dose) and at seven days' interval. If cows have tuberculosis of the udder there is no response. If she survives such treatment and still persists with active mastitis she is only fit for the local butcher if she is healthy in other parts of her body, but this is not likely. Therefore, the first loss is the best, and she should be shot and burned or buried deeply in some dry soil on the border of the cultivation paddocks. All cows suffering from mastitis should be isolated and the milk buried until such time as the vaccine treatment is carried out, and this could be done by the owner with the assistance, in an advisory capacity, of the Dairy Inspector of the district.

This is suggested as a very good and practical method of ridding herds of the more saturated cases of tubercular disease.

THE PAPAW.

By G. WILLIAMS, Instructor in Fruit Culture.

THE Papaw or Papaya (*Carica papaya*), originally reported as being indigenous to Central America and West Indies, is freely distributed throughout coastal Queensland. The small herbaceous tree is practically branchless and surmounted by a crown of large palmate leaves, at the base of which the fruit is produced, this usually maturing after the fall of the foliage from that part of the stem where it is situated. The branchless habit of the tree can be varied by the removal in the early stages of terminal buds, whereby branching is induced and several fruiting heads developed.

The Plant and Its Properties.

The succulent flesh is very agreeable to the taste, though preferred by many with the addition of sugar, lemon, or orange juice, the fruit being cut transversely, the seeds removed, and such additions as preferred applied in its capacious cavity. The fruit is credited with containing properties which materially aid digestion, as also are the seeds, which resemble watercress in flavour. The foliage applied as a wrapper is said to have the effect of rendering meat tender—a feature that exists mainly in imagination. From incisions made with a bone or ivory knife in the unripe fruit. the milky juice exudes freely and is collected, dried, and exported from the West Indies and Ceylon to other countries where it is sometimes used as a substitute for pepsin. The demand is said to be limited and irregular.

Under favourable conditions, the first fruit are matured within twelve months from planting; location and rainfall are responsible for variations. The term of productiveness is short, seldom exceeding four years, but this to some extent is compensated by its unbroken continuity.

Cultivation.

Fertile and well-drained soils are essential to successful cultivation. The most vigorous growth is evidenced and the finest fruit produced on volcanic scrub soils. The quality of the fruit varies under different conditions of soil, location, and humidity. Essentially a purely tropical product, the finest fruit are those matured without an excessive moisture. In some of the Northern scrubs Papaws are widely distributed, but under the influence of shade the trees are spindly and the fruit undersized and lacking in flavour. Fruit produced under semi-tropical conditions is admittedly inferior to the purely tropical product.

Varieties.

Various types or varieties have from time to time been introduced into Queensland, but the typical features have by cross-fertilization been almost eliminated. Two types introduced to the North worthy of mention are the New Guinea or "Long Tom" and the Cowleyii or "New Era" (said to have originated in the Philippines), both being bisexual. The elongated fruit of the former is not quite equal to the latter, but a heavier weight per tree is returned. Earlier introductions were confined to the ogininal unisexual variety, which from a batch of seedlings frequently developed an excess of male and consequently practically unproductive plants. though occasionally the panicles of male flowers are interspersed with those capable of fruit production; the fruit of such are invariably small and inferior. Various suggestions, more or less absurd, have from time to time been published as infallible tests for determining the sex of the young plant, but experience does not favour the acceptance of any of them. Among a batch of seedling plants a wide variation in vigour will be noted, and a reversion of the usual practice of selecting the strongest plants should be applied, for it is found that the most vigorous plants almost invariably turn out to be males.

Planting.

Seeds are planted in boxes or seed-beds under partial shade in early spring, and the young plants are put out when from 8 to 12 inches high, the foliage, except the young undeveloped crowns, being removed, allowing part of the petiole or leaf stalk to remain. Where plants are grown subject to the influences of shade, this should be removed several days prior to transplanting, also water should be withheld, but applied liberally just prior to removing, so that the roots may be mutilated as little as possible. In addition to fertility and good drainage, a soil containing a liberal proportion of humus favours development. No applications of fertilizers to light soils can maintain equal results. Liability or otherwise to frost should be considered

in respect to location, for there are few cultivated plants more susceptible to frost injury than the Papaw. In planting the possibility of numerous male plants is present. The effect to a great extent may be minimised by including in place of one plant two in close proximity, and subsequently removing one when the sex is determinable. If both are males they should be discarded, male trees being entirely superfluous. Six feet apart has been given as a reasonable distance for planting, but to this at least 2 feet can be added, with 9 or 10 feet between rows to allow for reasonable development and room for the necessary cultural operations.

Fertility being absolutely necessary, applications of fertilizers should be made in accordance with directions contained in the pamphlet "Complete Fertilizers for Farm and Orchard," issued by the Department of Agriculture and Stock, and obtainable on application to the Under Secretary, Brisbane.

Diseases and Pests Affecting the Plant.

Under fair conditions the Papaw is reasonably free from disease; fungus in Southern districts is sometimes evident on the fruit by discoloured areas of varying extent, causing decay in their vicinity and occasionally affecting the whole fruit. This is preventable by the application of Bordeaux mixture or Bordeaux powder. In some seasons the larva of a moth is persistent in its attacks upon the stem, which it usually enters close to the leaf bases, and may completely destroy the tree; against this it is questionable whether treatment is warranted. Red Spider amongst the young foliage and nematodes on roots are to a great extent attributable to placing plants in unsuitable soils, particularly those of a light sandy nature, though weather conditions adverse to growth are congenial to both pests. Dusting with fine sulphur will have some influence against the former, but remedial measures cannot be profitably applied against the latter.

Being a comparatively shallow rooter, weed growth should be eliminated from plantations and cultivation confined to a shallow depth, varying slightly according to the nature of the soil, 3 to 4 inches being quite sufficient in that of a close texture.

Marketing.

For marketing, sufficient care must be exercised so that the fruit is not bruised when handling, and packing is preferable in shallow trays or cases, so that there will not be undue pressure of fruit. Just at what stage of development the fruit should be gathered will vary according to distance from market and transport facilities, but the nearer the fruit approaches maturity at the time of taking from the tree the more pronounced will be its flavour, and when the market is readily accessible colouring should be evidenced at its apex.

In addition to its place as a dessert and entering into the composition of various condiments, the flesh of moderately mature fruit may by cutting into strips be satisfactorily dried by exposure. It is unlikely that the dried fruit will find a market where fresh supplies are available. The green fruit is utilised as a vegetable, treated and served in the same manner as a vegetable marrow.

QUEENSLAND SHOW DATES, 1932.

Killarney: 29th and 30th January.
Stanthorpe: 3rd to 5th February.
Warwick: 9th to 11th February.
Allora: 17th and 18th February.
Oakey: 19th March.
Goombungee: 2nd April.
Pittsworth: 6th and 7th April.
Chinchilla: 5th to 7th April.
Miles: 13th and 14th April.
Clifton: 13th and 14th April.
Toowoomba: 18th to 21st April.
Dalby: 27th and 28th April.
Charleville: 4th and 5th May.
Boonah: 4th and 5th May.
Mitchell: 11th and 12th May.
Roma: 16th and 17th May.
Ipswich: 17th to 20th May.
Gin Gin: 2nd to 4th June.
Marburg: 2nd and 3rd June.
Bundaberg: 9th to 11th June.
Rockhampton: 21st to 25th June.
Mackay: 28th to 30th June.
Rosewood: 15th and 16th July.
Royal National: 8th to 13th August.
Crow's Nest: 24th and 25th August.
Wynnum: 26th and 27th August.
Beenleigh: 16th and 17th September.
Rocklea: 24th September.
Nerang: 14th October.
Cleveland: 8th and 9th July.

INTENSIVE PASTURE MANAGEMENT—1.

By F. F. COLEMAN.

THE idea of "two blades of grass to grow upon a spot of ground where only one grew before" was mentioned by Swift in the early part of the eighteenth century; even rotational grazing is not a new idea as records exist of the movement of cattle from pasture to pasture, dating back to the latter part of the same century, and many dairymen in the southern part of England unconsciously used this method, by grazing rotationally small meadows adjacent to their homesteads. It is well known that some farmers as far back as the middle part of last century, in order to get an increased hay crop during their last year of tenancy, applied quick-acting nitrogenous fertilizers to grassland with the result that they produced a heavy crop of hay at the expense of the finer grasses, leaving the incoming tenant with a runout pasture. That nitrogen makes grass grow was a fact well known to agriculturists in Europe, but was overshadowed by the farmer's desire to increase the feeding value of his grassland, by top-dressing with phosphates to encourage the growth of clover.

In Queensland, with the exception of a few places, clover is practically absent and the copying of the phosphate methods adopted by the Southern States and European countries where clover is usually present, resulted in many opinions adverse to top-dressing of Queensland's coastal pastures. Some seven years since, a few small experiments were started to see the effect of various fertilizers. These experiments were afterwards extended to Runcorn, where clovers were entirely absent and the ground of a character not likely to give a quick response. The vicissitudes of the Runcorn experiments were written up by the Agricultural Chemist, Mr. J. C. Brunnich, and published in the Department's Annual Report of 1927. The experiments having been abandoned, records of after effects are not available. It is, however, known that when animals grazed on this area, the parts most closely grazed were those that had been top-dressed with a mixture giving a sufficiency of both nitrogen and phosphoric acid. Early in January, 1928, an experiment was started at Runcorn on land adjacent to the area previously abandoned, the objective being to try out animal preference or palatability and see the effect of suitable fertilizers on old *Paspalum dilatatum* pasture that had not been ploughed. The area in question was closely grazed during December, 1927, and then harrowed with ordinary iron harrows. It is now quite realised that better results would have been obtained had it been possible to use one of the stump jump renovators or some of the pasture harrows now on the market. Those used were the ordinary iron harrows not heavy enough for the purpose. During the first three weeks of January, just over six inches of rain fell. The fertilizers were applied on 24th January. The first area nearest to the gate accessible to animals did not have any fertilizer. The next portion had an application per acre of:—

Plot 1.—100 lb. ammonium sulphate, 159 lb. Nauru phosphate, 100 lb. superphosphate, 41 lb. potassium chloride.

The next area—

Plot 2.—100 lb. ammonium sulphate, 259 lb. Nauru phosphate, 41 lb. potassium chloride.

Adjacent to this was an area with—

Plot 3.—200 lb. superphosphate, 200 lb. Nauru phosphate.

and the last portion had—

Plot 4.—150 lb. ammonium sulphate, 237½ lb. Nauru phosphate, 150 lb. superphosphate, 61½ lb. potassium chloride per acre.

The different plots were in the same paddock and for purposes of reference can be called 0, 1, 2, 3, 4. The one without fertilizer being 0, which is before explained was nearest to the gate. The effect of the ammonium sulphate was well marked on the ninth day, when samples of the grass were cut from each lot. On or about the tenth or eleventh day some animals in an adjacent paddock broke through the fence and were with difficulty driven off the nitrogen plots. On the 20th and 44th days, grass samples were again cut for analysis, the results at the time were published, and afterwards appeared at the Brisbane 1928 Exhibition. At the time the green weight per acre was probably given too much prominence. The fact yet remains that without fertilizers in 44 days Plot 0 produced 3,062 lb. of green grass, Plot 1, 6,806, Plot 2, 4,840, Plot 3, 2,193, Plot 4, 17,658. It will, therefore, be seen, that any amount of twisting of the figures or explanations cannot evade the fact that the application of super and Nauru phosphate at the rate of 400 lb. per acre did not encourage the growth of grass. The portion that had ammonium sulphate at the rate of 100 lb. per acre and 100 lb. of super. per acre

with the addition of Nauru phosphate and potassium chloride produced more green grass than the portion with the same amount of ammonium sulphate and potassium chloride but without super. These plots were each about one acre in extent and the green weights ascertained from a series of cuttings. At the time, it was evident that those who advocated such dressing as 1 cwt. of super. and/or Nauru phosphate per acre, were attempting the impossible. Unfortunately, many dairymen consider all fertilizers to be super., and the quantity required 1 cwt. or less per acre, overlooking the fact that even in those areas where clover is in abundance applications of several cwt. per acre are often used.

The question of animal preference was tried out by putting about twenty head of stock into the old experiment area, and then letting them in through the gate that opened on the portion without fertilizers. Photos of the animals after they had been in the paddock just over half an hour were on several occasions taken. They invariably show the majority on Plot 4, that is the one top-dressed with 150 lb. ammonium sulphate and 150 lb. of superphosphate, the others more or less equally distributed between plots 1 and 2. On only one occasion did two animals stop on the super.-Nauru only, and the portion without fertilizer did not show any animals in the photos, nor were there any traces in that area of grazing, the greatest intensity of the grazing being on the plot with the largest amount of ammonium sulphate and superphosphate, followed by the paddock with lesser amounts of ammonium sulphate and superphosphate. The grass after March on the nitrogen portions had to be cut by a horse mower as at the time those interested in the experiment could not get sufficient stock to graze the area in the manner required.

Arising out of this experiment, endeavours were made to find a suitable site on someone's land where it would be possible to divide the area by fences and rotationally graze in order to give the stock the benefit of *young short grass* which has now been proven to be of high nutritive value and much appreciated by stock.

As a general principle it can now be accepted that rotational grazing fences should be erected in a manner calculated to give not less than 15 beasts to the acre; that is to say, anyone with a dairy herd of about 70 should have the area in each paddock not greater than 4½ acres. It is essential with all top-dressing that the land be first closely grazed, all rubbish and weeds cut down, and then treated with suitable harrows or a paspalum renovator of which there are several efficient makes on the market. Unless a thorough clear-up is made, it is impossible for the fertilizers to give their full effect. The results that will be published shortly of the experiments now being carried out by the Queensland Pasture Improvement Committee conclusively prove that the *carrying capacity of suitable land can be greatly increased* on areas of assured rainfall, *given efficient management* in the grazing and sufficiency of stock to utilise young grass when at its best, also by the careful preparation of the land and the sowing of suitable winter growing grasses, in particular such strains as are known to produce density of growth, leafiness, persistency, and at the same time to be of high nutritive value, combined with palatability. In this respect it must be pointed out that a good leafy strain of most of these grasses would not appear so high as the ordinary commercial types which readily produce seed heads. The strains, however, that produce an abundance of leafy herbage give more weight of feed per acre.

The fertilizers now recommended per acre on Queensland coastal dairy pastures are as follows:—

1 cwt. sulphate of ammonia (20.5 per cent. N.),
2 cwt. superphosphate (20.5 per cent. P_2O_5) water soluble phosphoric acid;

or—

1½ cwt. ammonium sulphate,
2 cwt. superphosphate;

or—

1½ cwt. ammonium sulphate,
2 cwt. superphosphate,
1 cwt. potassium chloride (50 per cent. K_2O).

In some cases where clover has hitherto failed to establish itself, double the amount of superphosphate should be used. It would also be advisable in such instances to apply at least 1 ton per acre of lime some time before the sulphate of ammonia is put on; although grass does best with ammonium sulphate and super., clover responds to superphosphate and potash. Most of the pastures would do better if limed; less than 10 cwt. of lime to the acre would be useless; even this quantity must not be mixed with sulphate of ammonia or applied just before its application. In all cases where cattle leave long grass and weeds, it is essential that they be cut down by a horse mower; and it will be found by any dairyman who makes a careful observation

that he is not getting the best out of his land by leaving long grass or other herbage not eaten by stock. The spreading of animal droppings by suitable harrows is also an essential of efficient management.

Grass and Clover Crops at Lawnton.

By the courtesy of the Queensland Acclimatisation Society, a series of grass, clover, and other forage plants are being grown at Lawnton. The plots include various strains of perennial and other rye grasses, *Phalaris tuberosa* (perennial canary grass), cocksfoot, &c., also Queensland's well-known Prairie, Rhodes and *Paspalum dilatatum* grasses. Although the first plots were only sown on 15th April, several cuttings have been made, which on analysis have again proved the high nutritive value of Prairie, closely followed by the special strains of perennial rye and other grasses. An article on the subject will shortly appear in the "Queensland Agricultural Journal"; in the meantime it is suggested that dairymen and others who are interested in winter-growing grasses might get into touch with this Branch so that arrangements can be made for them to inspect the plots, a careful examination of the growing plants being a more convincing argument than any amount of written matter.

Samples of these plants will be cut every few weeks. in order that analyses may be made showing their relative nutritive values at different stages of growth.

THE SILO.

It is contended that the New Zealand farmer gets a better and more average yield from his cows than the Australian farmer in general, and the Queensland farmer in particular.

An investigation carried out some time ago, in order to determine the actual cause for this difference, led to conclusions which can be placed under several headings, the principle reasons being—

(1) Difference and greater variation in climate with consequent variation in feeding.

(2) Quality and breeding of the stock.

(3) Uniformity of feeding and housing.

It is quite evident that where nature has not provided a uniform food supply the ingenuity of man must provide something that will improve the conditions. In cold climates where it is impossible for an animal like the cow to live without shelter in the winter, man must take care to house it and feed it as a domestic animal.

The Australian farmer, as a rule, has no conception of the care and trouble which, for instance, the Danish farmer has to take with his animals, and has no conception to what extent the Danish farm cows repay for the care given to them. The Australian farmer is still very fortunate in this respect—that he has not to expend a large amount of money on providing winter shelter and fodder for his cows, and he considers it a hardship, sometimes, to even provide some form of dry fodder such as hay, because it entails extra work.

Many dairy farmers in Queensland are heard to express the opinion that it is easier for them to milk more cows, so long as they will live on the grass, than it is to have a better kind of cow which has to be fed and cared for. Whether this opinion is correct or not is a matter for the individual to judge, but for those who are anxious to improve the uniformity of their yield and so ensure a more constant and reliable income, there is no question but that the silo is one of the best means available.

Until recently the building of a silo was a fairly extensive undertaking which necessitated a fair amount of plant and equipment, and someone accustomed to and knowing a good deal about concrete and reinforcing was also desirable, and a number of experts, who advocted silos in order to secure the job, generally placed a fairly high value on their services.

A large silo is undoubtedly cheaper in proportion to the storage capacity than a small silo; but a large silo could easily prove an expensive proposition to run on account of the wastage. A reasonable average cost for a silo is, however, somewhere in the neighbourhood of £1 per ton capacity, providing that the capacity of the silo is not less than about 70 or 80 tons.

The diameter of a silo has, of course, to be governed by the quantity of ensilage used per day, and a small silo would, in that case, in spite of the higher first cost, be a more payable proposition to use than the larger one.

A recent invention which is advertised in the Journal will place a silo within the means of every dairy farmer who cares to improve his feeding arrangements, and who would like to ensure a uniform cheque every month. The erection of the silo now advertised is a very simple matter indeed, and there is hardly any need to stress the advantages of a silo.

The effect of uniform feeding on the breeding of stock is well known to all careful breeders. It is only by strict attention to such points as have been mentioned that the best points can be brought out in any breed, and the silo is a means of overcoming intermittent pasture difficulties and other feeding problems. After all, what one can do another can, and seeing that the New Zealand farmer, and very largely the Victorian farmer, has overcome most of his difficulties just by such means, there is no reason why Queensland should not be at the head of the list rather than, as at present, at the bottom.

EXPORT TRADE IN FAT LAMBS.

A memorandum from the Chief Veterinary Officer, Commonwealth Department of Markets, has been received by the Department of Agriculture and Stock, embodying a list of suggestions prepared by Mr. R. H. Heywood, veterinary officer, London, in connection with the export trade in Australian fat lambs. These suggestions are as follows:—

"1. The past season has shown some evidence that the prejudice which has characterised the trade in Australian lambs is weakening, and this can only be due to the improvements which have manifested themselves in the quality of the lambs themselves, to the good dressing, and the excellent condition in which they have been marketed. The natural bloom on carcases has been a striking feature, far in advance, it is said, of New Zealand and South American shipments. These facts alone suggest the need for the greatest attention to details, however unimportant they may appear to shippers.

"2. With improvement in the lambs' points which were relatively unimportant have assumed significance, and there is one in particular to which I have been requested to refer.

"3. The tension placed on the shoulder muscles by stringing (the necks) too tightly has a bad effect on both the appearance of the forequarter and on the joint itself when the carcass comes to be cut up by the retailer. Tight stringing draws the shoulder muscles taut, and if cut when frozen they recede from the shoulder blade when defrosted. It is thought that by allowing up to an inch on either side this can be corrected. The foreleg should hang not naturally, perhaps, but in a straight line with the hind leg. This is not easy to explain, but is easy to demonstrate by means of a straight edge.

"4. It is most important that no carcases which do not conform to the characteristic standard of the Down Cross lamb should be marked as Down Cross, but it is equally important that characteristic Down Cross lambs should be so marked.

"5. It is desirable that Down Cross tags should be attached by means of a coloured string, and also the wraps should be marked distinctively in the same colour.

"6. It is important that tagging should be done uniformly (always on the same leg) and neatly. Even the string itself is worthy of attention, and apart from the point of quality there are quite a number of ways in which the attractiveness of consignments can be improved.

"7. Generally speaking, the clearer and more simple that markings are made the better, and shippers will be wise to adopt the suggestions of their agents regarding distinctive markings. The latter are unlikely to suggest anything which will not facilitate sorting, for this sometimes is a laborious and costly process.

"8. Regarding consignments, where tags should bear the shippers' individual mark, a simple method has been adopted in New Zealand which appears to give complete satisfaction to the trade. Each shipper is given a number 1, 2, 3, and so on, and if his consignment includes 2's, 3's, and 4's (weight grades) his tag marks will be simply in the case of No. 1-12, 13, 14, and in the case of No. 9-92, 93, 94, and so on. The last figure is accepted in store as the grade mark. As a double precaution, the same number as is borne by the tag is stencilled in bold figures on the wrap.

"9. When arranging parcels for export the Downs should be separated from the remainder, and this should be stated on the bill of lading, as this is the only guidance the port of London authority has in arranging storage.

"10. Shippers of small lots would be wise to adopt pooling with a view to reducing storage expenses, though incidentally buyers will more readily take up parcels of reasonably large quantities. Parcels of under one hundred are subject to an additional charge of one-third, and there is a minimum charge of 3s. (for even one carcass).

"11. It has been noticed that when the atmosphere is at all moist the dye from red labels which are used runs freely, and in some cases is most unsightly. Waterproof colours should be used, or the coloured labels replaced by some other distinctive marking."

TRAVELLING STOCK BY LAND, RAIL, AND SEA.

By W. C. CARMODY, Stock Inspector.*

THIS talk is not intended for those who are conversant with the law relating to travelling stock, but for those who do not know the requirements of "*The Diseases in Stock Act of* 1915" and amendment Act of 1930.

Points to be Observed.

Stress is laid on the necessity of strictly observing the following points:—

(1) Lodge your notice of intention to travel stock with the inspector of stock.

(2) Obtain the permit to travel.

(3) Fill in the waybill supplied, with the number, brands, and description of the stock, accurately describing the brands. If a beast is unbranded, that is a fact which must be stated.

(4) Do not fail to give notice when entering on to a run, not more than forty-eight hours nor less than twenty-four, to the occupier by letter, telephone, or telegraph.

(5) Include plant horses on the waybill, or a separate waybill if horses are owned by drover.

(6) Travel the distances required—6 miles for sheep, 8 miles for cattle a day. Close gates after passing through.

(7) Report promptly any outbreak of disease to nearest stock inspector.

(8) Do not leave any diseased or dead stock on any run or stock route.

(9) Do not depart from the route set out in permit and waybill without the authority of an inspector.

The Permit to Travel.

If wishing to travel stock the first step is to fill in the notice of intention to travel stock (7th Schedule), which sets out the number, description, holding where located, name of owner, the route to be travelled, name of person in charge, date of proposed departure, and destination. Having lodged the notice of intention to travel stock with the inspector for the district or place, a permit (8th Schedule) will be issued by an inspector for the number of stock to be travelled, setting out in slightly altered form the particulars contained in the notice of intention. Having received the permit to travel, it will be noticed that a time limit is stated thereon in which the journey must be commenced.

The Waybill.

With the permit a waybill is issued (9th Schedule) which is printed on the back of the permit. This is a very important form, and great care should be taken to complete it correctly, setting out the name and address of owner, place or run, number of stock, brands, description, destination, consignee, how travelled (rail or road or both), and route to be taken. The brands, for purposes of identification, are most important, and therefore the stock travelled should be described fully and accurately.

* In an address by radio from Station 4QG.

Where station cattle bearing only one brand are being travelled, it is an easy matter to complete the description, but where the cattle are a mixed lot, and bearing different brands, more care must be taken. The brands should be grouped, e.g., five of one brand, ten of another, and so on.

If the cattle should be cross-branded—that is to say, all the cattle bear the one brand (put on by purchaser) in addition to the different brands already mentioned, the grouping should apply, plus the cross brand, on all of the cattle. If travelling by road the plant horses used should be described on the waybill; frequently the horses will belong to the drover. Therefore it is the drover's duty to provide a waybill for his own horses.

If the waybill is accidentally lost or destroyed, the drover should apply to the nearest inspector of stock or police officer for an interim waybill. The inspector, on satisfactory proof of such loss, grants an interim waybill on payment of £1.

Daily Travelling Distance.

Cattle must travel on an average 8 miles a day and sheep 6 miles. It is obvious that when stock are travelled by rail or sea, the distances mentioned will not apply.

It is not necessary to brand sheep travelling by rail with the letter T (T denotes travelling sheep), or which are not intended to be driven more than 40 miles to a destination, or which may have strayed on to a neighbour's holding, or which are intended to be driven to a pound. Any justice of the peace, police officer, or inspector duly authorised may inspect travelling stock. The drover should, on request, submit the stock in his charge to such inspection, and produce his waybill. Any drover who fails to comply, or travels stock by any other route than that described in the waybill, unless with the approval of an inspector, or fails or refuses to produce the waybill on the request of any inspector, justice of the peace, police officer, or occupier of any holding, through or alongside which any such stock are, or have been, travelling; refuses to permit those authorised when necessary to examine and count such stock, or fails to assist at any inspection, examination, or count of such stock when required; has in his possession or charge stock not fully and accurately described in the waybill, is liable to a penalty not exceeding £50.

Any person who purchases or receives from any owner or drover any stock not fully and accurately described in the waybill, or any stock from any drover who does not produce written authority from the actual owner of such stock to sell or otherwise dispose of them, is liable to a penalty not exceeding £50.

Reporting Stock Passings.

The owner or drover in charge of travelling stock who intends to drive them on or across any holding, or along any road which intersects or forms a boundary of any holding (unless the road is fenced on both sides), should give the occupier of the holding not more than forty-eight hours nor less than twenty-four hours' notice by letter, telephone, or telegraph, to the head station or principal homestead. Failure to give the prescribed notice renders the owner or person in charge liable to a penalty not exceeding £50. The notice prescribed shall not apply to an owner of cattle or horses in use at the time for the purposes of his calling.

Outbreak of Disease.

Should disease make its appearance in travelling stock, the owner or drover should, before the expiration of one week from the time of his discovering the fact, give notice thereof to the nearest inspector. The owner or drover should as far as possible draft out and keep separate all diseased stock from the healthy animals.

It is an offence to leave any infected stock or any carcass on a road or stock route. The penalty for this is a fine up to £10.

Play the Game on the Road.

It is an offence not to close gates erected on a road or stock route, or to give false information to an inspector on obtaining a permit for the removal of stock, or regarding the ownership of stock.

Motor Transport.

Stock are sometimes travelled by motor lorry. Such transport comes under the Act the same as travelling by rail.

CLIMATOLOGICAL TABLE—OCTOBER, 1931.

Compiled from Telegraphic Reports.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·03	85	73	86	15, 18, 21, 22, 24, 26, 30, 31	66	12	15	2
Herberton	..	79	57	90	10	46	28	57	3
Rockhampton	30·09	84	63	93	28, 30, 31	51	5, 6	50	3
Brisbane	30·12	78	58	90	10	49	12	58	6
Darling Downs.									
Dalby	30·09	80	52	93	30	39	5, 6, 12	239	3
Stanthorpe	..	71	44	86	30	30	19	216	5
Toowoomba	..	74	49	88	30	39	5, 12	131	3
Mid-Interior.									
Georgetown	29·99	92	66	99	31	59	6	198	3
Longreach	30·03	88	58	102	29	44	5	389	4
Mitchell	30·08	82	50	95	29	35	5	143	5
Western.									
Burketown	29·99	91	67	97	19	55	5	0	..
Boulia	30·03	89	60	104	2, 29	48	4, 5	22	1
Thargomindah	30·07	83	55	100	29	40	5	30	2

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of October, in the Agricultural Districts, together with Total Rainfall during October, 1931, and 1930, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.,	No. of Years' Records.	Oct., 1931.	Oct., 1930.
North Coast. ..	In.		In.	In.
Atherton	0·90	30	1·11	3·02
Cairns	2·09	49	5·23	17·58
Cardwell	2·05	59	3·40	11·34
Cooktown	1·08	55	0·15	5·80
Herberton	0·91	44	0·57	3·09
Ingham	1·92	39	3·35	19·15
Innisfail	2·99	50	4·57	13·47
Mossman Mill ..	3·10	18	4·46	12·13
Townsville	1·37	60	3·68	10·79
Central Coast.				
Ayr	1·00	44	1·09	3,94
Bowen	1·05	60	0·82	2·00
Charters Towers ..	0·69	49	1·01	2·10
Mackay	1·70	60	1·18	0·66
Proserpine	1·77	28	0·90	1·94
St. Lawrence ..	1·75	60	0·24	1·09
South Coast.				
Biggenden ..	2·18	32	2·53	0·82
Bundaberg	1·99	48	1·47	1·97
Brisbane	2·53	80	0·58	1·97
Caboolture	2·51	44	0·89	3·92
Childers	2·48	36	2·26	1·90
Crohamhurst ..	3·29	38	1·61	1·86
Esk	2·53	44	1·17	4·12
Gayndah	2·33	60	2·38	0·84
Gympie	2·69	61	1·48	2·31

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.,	No. of Years' Records.	Oct., 1931.	Oct., 1930.
South Coast—continued:	In.		In.	In.
Kilkivan	2·61	52	0·65	1·12
Maryborough ..	2·63	59	1·28	0·79
Nambour ..	2·97	35	0·99	1·94
Nanango	2·28	49	0·87	1·69
Rockhampton ..	1·78	44	0·50	1·08
Woodford	2·46	44	0·86	1·77
Darling Downs.				
Dalby	2·00	61	2·39	1·05
Emu Vale	2·17	35	1·00	2·28
Jimbour	1·87	43	1·91	1·22
Miles	1·96	46	1·84	1·89
Stanthorpe ..	2·55	58	2·16	2·31
Toowoomba ..	2·57	59	1·31	2·92
Warwick	2·29	66	1·33	2·57
Maranoa.				
Roma	1·75	57	0·72	2·61
State Farms, &c.				
Bungeworgorai ..	1·42	17	0·82	2·50
Gatton College ..	2·02	36	1·00	1·41
Gindie	1·36	32	0·33	0·15
Hermitage ..	1·90	25	0·97	1·84
Kairi	1·07	17	..	3·70
Mackay Sugar Experiment Station	1·44	34	0·94	0·62

J. H. HARTSHORN, Acting Divisional Meteorologist.

Answers to Correspondents.

Tanning Marsupial and Other Skins.

The following information is supplied in answer to several correspondents:—

(1) *The Lightning Process.*—Cut off all useless parts of the skin, and then soften the skin by soaking so that all flesh and fat may be scraped from the flesh side with a blunt knife. Next soak the skin in warm water for an hour, and during that time prepare equal quantities of borax, saltpetre, and glaubers salt, with enough water to make into a thin paste. About half an ounce of each ingredient will give enough for an opposum skin, and proportionately more will be required for larger skins. When the skin has been soaked in the warm water, lift it and spread it out flat, so that the paste may be applied with a brush to the inside of the skin. More paste will be required where the skin is thick than where it is thin. Double the skin together flesh side inwards, and place it in a cool place for twenty-four hours, at the end of which time it should be washed clean and treated in the same way as before with a mixture of 1 oz. of sodium carbonate (washing soda), ½ oz. borax, and 2 oz. hard white soap; these must be melted slowly together without being allowed to boil. The skin should then be folded together again and put in a warm place for twenty-four hours. After this, dissolve 4 oz. alum, 8 oz. salt, and 2 oz. of sodium bicarbonate (baking soda) in sufficient hot water to saturate the skin. The water used should be soft, preferably rain water. When this is cool enough not to scald the hands, the skin should be immersed and left for twelve hours. Then wring it out and hang it up to dry. The soaking and drying must be repeated two or three times, till the skin is soft and pliable, after which it may be rubbed with fine sandpaper and pumice stone to obtain a smooth finish.

(2) A second method, in which wattle bark is the tanning agent, is not so quickly accomplished, but properly adopted it should give better results than the other. Collect some sound wattle bark and make a strong decoction by boiling or steeping the bark in water. A bushel of crushed bark from a tannery, if one is near at hand, will be found an easy way of getting the best bark. The skin should be scraped clean on the inside, as in the lightning process, before steeping begins. It is best to let the skins lie as flat as possible while soaking, and a large, square, zinc-lined packing case is therefore preferable to a barrel. The skins should be thoroughly covered with the liquid, which must either be changed once a week or boiled anew and skimmed. While the skin is out of the liquid each week it should be lightly scraped. Large skins take up to six weeks to tan well, but opossum skins will not require more than a month.

(3) Another method spoken highly of by those who have tried it, especially where a clean white skin is required, is well worth trial.

Pour 2 quarts of boiling water over 1 quart of bran, and in 2 quarts of warm water at blood heat dissolve as much salt as it will take up—between 4 and 5 oz. Then mix the salt water and bran water together, making 1 gallon to which add 1 oz. of sulphuric acid. Soak the skins in this mixture using an earthenware vessel and stirring well for twenty minutes, then rinse in clean cold water and hang to dry in a shady place. As they dry, pull the skins well and scrape off any pieces of fat that may be found. The skins, when dry, should be white.

The following recipes are also well worth a trial:—

(4) Tack the skin tightly on a board; scrape off all the loose fat and work in chalk, rubbing it in well. When the chalk begins to powder and fall off, remove the skin from the board and rub in plenty of powdered alum. Wrap up closely and keep in a dry place for a few days. This makes the hide pliable; it will retain its hair.

(5) Mix two parts of saltpetre and one of alum. Sprinkle on the flesh side of the skin, roll it up and lay it in a cool place. After a few days spread out to dry. Scrape off the fat and rub it until the hide is pliable.

(6) *Method for Tanning Woolly Skins.*—Preparing sheepskins for mats, woolly waistcoats, &c., is simple and quite satisfactory where a particularly supple leather is not required. First trim all ragged edges and remove as much flesh, fat, &c., as possible without damaging the pelt. Then place the skin on the floor or on some other flat surface and proceed to wash the wool thoroughly with warm water and soap, and then with clean water. Remove all surplus water from the wool by scraping or squeezing with a smooth board. Take up the skin and shake it well and then place it fleece down on a clean surface, and take a good handful of alum, to which a very little salt may be added, and proceed to rub it well into the pelt with a rotary motion over all the surface equally. Then fold the skin, fleece outward, and

let it stand for three days. After this, open and hang the skin for a while and then start to scrape it with a furriers knife—a knife without an edge—always scraping in the same direction. Three scrapings are needed to properly finish the pelt. With different skins, discretion must be used in the matter of scraping. Strong pelts will naturally require and stand a more thorough scraping.

(7) *White Hide: Tanning Process on the Farm.*—As it is almost impossible to enumerate the uses to which good white hide may be put, especially on a farm, the necessity for careful selection of the hide to be treated cannot be too greatly stressed.

The ideal hide for general purposes, such as harness repairs, leg ropes, cart and sulky reins, bridles, bullock whips and falls, straps of all sizes, &c., is that of a fat, four-year old, whole-colour Shorthorn steer or heifer, the latter being slightly finer.

If a thinner and much finer quality hide is required. a four to six-year old, whole-colour Jersey female in good condition will produce it. Hides to be carefully avoided for farm tanning are those of spotted or poor animals, of whatever age. In the former case it has been conclusively proved that wherever there is a white patch the hide is thinner, and good work cannot be done with a hide of varying thickness; in the case of poor animals the hide is practically useless.

Before killing have ready a well-scoured cask (a 40-gallon one will hold any hide), put in about 16 gallons of water, and a good half bucket of slaked lime. This is to loosen the hair and neutralise the fat. Bleed the animal first from the heart, then sever both artery and jugular vein in the neck. Have the head slightly down hill if possible. Skin carefully as a bad score or cut may spoil an otherwise good strip. While warm, skin off as much waste as possible. Trim off scraggy leg and belly points, and allow the hide to become cold.

Stir the lime and water, and lower the hide slowly into the liquid to prevent the formation of air pockets, poke down, and stir again. Weight down with wood any portion that comes to the surface. Do this once a day or more frequently until the hair begins to come off. Throw the hide over a barrel or on a flat surface and scrape both sides clean with a skinning or fleshing knife. Be careful not to mark the hair side with the knife. If all the hair does not come off at first, put back for a day or two. Empty and sluice the cask; about half fill it with clean water, and leave the hide in it while preparing the curing solution.

Dissolve 8 lb. of salt, common or coarse, in half a kerosene tin of boiling water; leave to cool. Dissolve 4 lb. of powdered alum in half a kerosene tin of boiling water; leave to cool. Mix 8 lb. of white flour into a thin paste, free of lumps. The best way to do this is to put about 2 lb. of flour into a kerosene tin and mix into a stiff paste with cold water, add a little more water; stir briskly with either the hands or a stick. Repeat this until the tin is about half full. The hide can now be thrown over a fence or the like to drain. Empty the cask and put the flour paste in. Mix more flour as before up to 8 lb. and add to that in the cask. When the alum and salt solutions are cool, add the flour paste and mix thoroughly. Allow to stand over about fifteen minutes and mix again. Lower the hide as before and add just sufficient clean cold water to cover. Poke down with a heavy stick until you are sure that all air is out, and weight with wood any portion that comes to the surface. Leave for two days. Stir at least once a day for three weeks. Take care each time to stir right from the bottom; get all the air out, and weight it down as before. Do not allow iron to come into contact with the hide when in the solution as it will leave an indellible rust patch.

When the time is up, hang the hide in the shade, throw a few buckets of water over each side, and leave for about half a day, reversing it occasionally. Spread on a flat surface, and rub in with a smooth-ended piece of wood, equal parts of common tallow and neatsfoot oil on one side only, using plenty. Leave for a few hours if convenient. then roll up as tightly as possible. Wrap up in bags and leave for a few days, when it will be ready for use.

THE JOURNAL APPRECIATED.

A Clifton reader writes:—"We appreciate the excellent articles in the 'Queensland Agricultural Journal' very much. It always contains something worth reading and expressed in a fresh style."

General Notes.

How to Mix Paint.

The different coats of paint vary in their composition. The first coat laid on new work requires a good deal of oil to soak into the material; on old work the first coat requires turpentine to make it adhere. The second coat contains a proportion of turpentine to make it work smoothly, and to the final coat is added the colouring material.

The first coat of paint applied to newly-worked wood is termed the priming, and before it is applied all holes should be neatly filled up with putty made of whiting and boiled oil. Nothing is gained by laying the paint on thickly; a thick film naturally takes longer to dry than two thin coats. Paint is thinned with linseed oil or turpentine. An excess of turpentine gives the paint a dull appearance.

When the surface to be painted is already covered with old paint, this should be either removed by means of a spirit lamp or rubbed down with a pumice stone or a smooth bit of marble. The exact proportion of ingredients to be used in mixing paint depends upon various conditions; but for inside work, and to cover 100 square yards of newly-worked pine, the following are the approximate quantities:—

Primary red lead, ½ lb.; white lead, 16 lb.; raw oil, 6 pints; drier, ¼ lb. Second coat: White lead, 15 lb.; raw oil, 3½ pints; turpentine, ½ pint; drier, ¼ lb. The third and fourth coats consist of 13 lb. white lead and raw oil, turpentine and drier as before. The quantity of colcuring matter to be added to the white lead base depends upon the shade desired.

Stone colour is produced by adding burnt or raw umber and yellow ochre. For French grey add Prussian blue and a little lake, used in different proportions. These will make purples and lilacs of all shades. Spanish brown or Venetian red or black, thinned with boiled oil and a little turps, will porduce chocolate-coloured paint.

Staff Changes and Appointments.

Mr. Thomas Kerwin, of Mountain View, Coochin, via Boonah, has been appointed an Honorary Ranger under and for the purposes of "*The Animals and Birds Acts*, 1921 *to* 1924," and "*The Native Plants Protection Act of* 1930."

Mr. C. G. Revitt, of Dunk Island, has been appointed as Honorary Ranger under the Animals and Birds Acts.

Constable C. R. Cooke, who is in charge of the Bell district, has been appointed also an Inspector under the Slaughtering Act.

Mr. H. J. Freeman, Senior Instructor in Fruit Culture at Cairns, has been appointed also an Inspector under the Diseases in Stock and the Brands Acts.

Mr. C. S. Clydesdale, Senior Instructor in Agriculture in the Department of Agriculture and Stock, has been transferred to Rockhampton, where he will fill the position recently rendered vacant by the appointment of Mr. G. B. Brooks as Director of Agriculture.

Provisional Maize Board.

In pursuance of the provisions of "*The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1928," the following have been appointed members of the Provisional Maize Board until the 14th October, 1932:—

Messrs. W. A. Fielding (Moreton District); J. Archibald (Darling Downs District); W. L. Osborne (Burnett District); E. Graham (Director of Marketing); J. McRobert (Chairman, Executive Committee of the Council of Agriculture); and Wm. Bailey (Atherton Tableland Maize Board).

Arrowroot Board.

The Governor in Council has approved of the issue of an Order in Council under the Primary Producers' Organisation and Marketing Acts, adding two subsections to Section 15 (1) of the abovementioned Acts, which apply to arrowroot.

These subsections provide that an arrowroot grower or miller shall not, without the prior written consent of the Board, remove any of his commodity except for the purpose of delivery to the Arrowroot Board or its agent, as required by Section 15 (1) of the Acts. Also, a penalty is imposed for any contravention or evasion of the above.

A Monto Sanctuary.

A portion of "Rockybar," Hawkwood, in the Monto district, the property of Mr. R. A. Hamilton, has been declared a sanctuary under the Animals and Birds Acts, in which it will be unlawful for any person to take or kill any animal or bird.

Trees and Citizenship.

It is now clearly seen that the man who plants trees is rendering an even greater service to his country than the man who grows food (writes Richard St. Barbe Baker in Melbourne "Argus"). Tree-planting is becoming the touchstone of true citizenship. In planting a tree man is for ever safeguarding the future. The science of forestry arose from the recognition of a universal need. It embodied the spirit of service to mankind in attempting to provide means of supplying every necessity of life, and, in addition, of ministering to man's æsthetic taste and recreational interests. In Australia there is untold wealth in the forests. Trees which formerly have been regarded as comparatively useless are finding fresh markets, and most varieties of eucalypt in due time will be highly used in industry. These forests are a priceless heritage, which must be handed down to posterity. There is no place in the world that can grow the eucalypt in such profusion as can Australia. There is a variety for each day in the year, and each and all will contribute their share to the prosperity of the country.

Broom Millet Board.

The Governor in Council has approved of the issue of an Order in Council under "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1930," extending the operations of the Broom Millet Board for a further period of three years from the 1st November, 1931, to the 31st October, 1934.

The term of the present Broom Millet Board will expire on the 31st October, and an Order in Council giving notice of intention to extend the Board for another three years was approved on the 10th September last. A petition for a poll to decide whether or not the Board should be extended was invited, and as no petition was received, and in accordance with the provisions of the Acts, the Order in Council to extend the Board for a further three years has been approved.

Cattle Poisoning Sawfly.

The cattle poisoning sawfly has been the cause of considerable losses to cattle-growers in the Maranoa district this year. The Minister for Agriculture and Stock (Mr. H. F. Walker) stated recently that as soon as advice was received by his Department indicating the presence of sawfly larvæ on the ground within reach of cattle, an officer of the Entomological Branch was despatched to the infested area. That officer made a series of field observations and a considerable quantity of material was brought to Brisbane for examination in the departmental laboratories. The Agricultural Chemist of the Department is conducting a series of analyses which it is hoped will shed very considerable light on the problem. Mr. Walker said he hoped to be in a position to authorise the publication of a progress report at an early date, and that such report would indicate the most suitable lines along which control might be exercised.

Mr. Walker said that according to newspaper reports the opinion had been expressed that the sawfly problem was a more serious one than the buffalo fly was ever likely to be in those districts in which the sawfly was responsible for losses. The relative importance of the two pests in the Maranoa district, should the buffalo fly ever become established therein, was, of course, a matter on which there might very legitimately be a difference of opinion at the present juncture. With respect to the relative importance of the two pests to the State as a whole the Minister. however, held very definite opinions. As a result of a recent personal investigation in the Gulf country, he was convinced that the buffalo fly was a much graver menace to Queensland cattle-growers than the sawfly was ever likely to be. It must be remembered that the buffalo fly, which is an introduced pest, had so far infested only a very small proportion of the country which was suitable for its propagation in the State of Queensland. The sawfly, on the other hand, was a native insect which has already occupied the territory suitable to its propagation, and its association with losses in cattle was not likely to extend. While holding these views as to the relative importance of the two pests, Mr. Walker was nevertheless very appreciative of the unfortunate position of those cattle-growers who had suffered serious losses. As indicated, however, the Department had promptly taken up the investigation of the practical aspects of control as soon as this year's outbreak had occurred.

An Oxley Creek Sanctuary.

The Governor in Council has approved of the issue of an Order in Council declaring a certain area surrounding Oxley Creek to be a sanctuary under the Animals and Birds Acts. It will be unlawful for any person to take or kill any animal or bird within this area, which may roughly be described as contained within the boundaries from Softstone street, Tennyson, by the Yeerongpilly Golf Links, Sherwood road, Ipswich road to Oxley Hotel, then by Oxley road to the Brisbane River at Albert Bridge, and by the right bank of the river to Softstone street.

Buffalo Fly.

As an instance of the activity of the buffalo fly in the Gulf area at a period of the year when the pest is popularly supposed to be quiescent, the Minister for Agriculture and Stock (Mr. H. F. Walker) referred to an extract from a letter recently received from the Superintendent at Mornington Island, in the Gulf of Carpentaria, in which he advised that the buffalo fly was still active amongst the cattle on the Aboriginal Settlement. He stated that reports from musterers indicated that many of the cattle have nasty open sores on their shoulders and around their eyes as a result of the fly, and he expressed a hope that a remedy would soon be found, otherwise he forsaw the possibility of the passing of the small herd at the Settlement, which had been gathered together at no mean expenditure of time and trouble.

Provisional Maize Non-Marketing Board.

Executive approval has been given to an Order in Council under "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1930," constituting a Provisional Maize Non-Marketing Board.

The Order provides that the provisions of the abovementioned Acts shall apply to the maize industry, and all maize grown in Queensland, except that grown on the Atherton Tableland, shall be a commodity under the Acts.

There shall be constituted a Board for the industry, excluding the Atherton Tableland. Until the Board is empowered by Order in Council, subject to an affirmative vote of the growers, to undertake marketing functions, the Board shall not be a marketing Board.

The Board shall operate for twelve months, and shall consist of one representative of growers from each of the Moreton, Darling Downs, and Burnett districts; the Director of Marketing; the Chairman of the Executive Committee of the Council of Agriculture, and, when necessary, one representative of the Atherton Tableland Maize Board.

The Council of Agriculture shall nominate the growers' representatives on the Board, and the Minister shall appoint the members to hold office for the term of the Board.

The functions of the Board shall consist of—

(*a*) Investigations regarding the manufacture of maize by-products and the extraction of power alcohol.

(*b*) Procuring or preparing reports regarding the marketing of the product.

(*c*) Arranging with produce merchants and agents with a view of improving existing marketing conditions.

(*d*) Arranging for the submission of marketing proposals to growers at a time considered opportune, and conducting such organising arrangements as may be considered desirable to ensure the acceptance of same by growers.

(*e*) Imposing a levy, with the approval of the Minister, on growers (except maize grown on the Atherton Tableland) to cover administrative and other expenses incurred by the Board, such levy to be for such term and at such rate (not exceeding one penny on every £2 value of maize marketed) as the Minister shall determine.

(*f*) Taking action to improve the conditions of growers pending the application of control to the marketing of the commodity.

(*g*) Issuing, through the Minister, periodical reports.

The Board may call for returns from growers showing the quantity of the commodity held at any time and any other particulars as may be specified.

Cotton Board.

The following nominations have been received in connection with the election of six growers' representatives to the Cotton Board:—

District No. 1—
John Beck (Stanwell);
Francis Albert John Bone (Bouldercombe, via Rockhampton);
Joseph Henry Cummings (Mount Larcom).

District No. 2—
Harry Reeves Brake (Wowan);
Charles George Young (Wowan).

District No. 3—
Arthur Edwin Balchin (Mount Scoria, Thangool);
George Herbert Bradley (Argoon);
James Patrick Fleming (Biloela);
Noel Richard Mullally (Goovigen).

District No. 4—
James Bryant (Chowey) returned unopposed.

District No. 5—
Charles Litzow (Vernor);
David Charles Pryce (Toogoolawah).

District No. 6—
Daniel Jones (Brisbane);
Ferdinand August Kajewski (Ma Ma Creek, via Grantham).

The election will be by postal ballot, and the date fixed for the return of the voting papers is the 9th December.

Control of Brumbies.

The Governor in Council has approved of the issue of a Proclamation under "*The Diseases in Stock Acts*, 1915 *to* 1930," declaring the Toowoomba and Rockhampton Stock Districts as districts for the control of "brumbies" from the 1st November, 1931, to the 29th February, 1932.

The Governor in Council has approved of the issue of a Proclamation under "*The Diseases in Stock Acts*, 1915 *to* 1930," declaring the Cairns and Cooktown Stock Districts as districts for the control of "brumbies" from the 17th October, 1931, to 12th January, 1932.

The Governor in Council has approved of the issue of a Proclamation under the Diseases in Stock Acts, proclaiming the Stock Districts of Clermont and Springsure as Districts for the control of "brumbies" or worthless horses, for the period from the 1st December, 1931, to the 31st March, 1932.

The abovementioned Acts provide, among other things, for the destruction of brumbies on stock holdings in Queensland under certain conditions. The provisions, however, only apply to such portions of the State as are proclaimed by the Governor in Council, and are limited to a period of not more than four months in any year. Destruction of brumbies, therefore, may be carried out in the above districts by stock owners at any time during the period stipulated, provided that all formalities required by the Acts have first been observed.

World-wide Demand for British Breeds of Pigs.

The National Pig Breeders' Association of England reports that during 1930 over 300 pedigree pigs were exported from the British Isles to overseas customers. During the last three months of the year forty export certificates were issued in respect of pedigree Large Whites, Middle Whites, Tamworths, Berkshires, and Wessex Saddleback pigs. Many of the orders were "repeats," which affords further proof of the value of British pigs for improving the standard of the breeds in other countries. Their 1930 volume of trade was a not inconsiderable contribution to Britain's agricultural export trade, and one which indirectly benefits many others than the actual vendors of the exported stock. Among other countries stock were sent to Latvia, Hungary, Portugal, France, Poland, Kenya, India, Japan, Germany, and Australia.

Obituary—Mr. Harold Lloyd Pentecost.

The death occurred on Sunday, 27th September, of Harold Lloyd Pentecost, an officer of the Herd Testing Division of the Department.

Mr. Pentecost, who was 54 years of age, was a native of Mornington, Victoria. He came to Queensland at an early age and engaged in the cheese industry at Beenleigh and other centres. He then settled in the Warwick district, where he was responsible for the successful establishment of cheese factories at Greymare, Rodger's Creek, Pratten, and Omanama. In April, 1922, he was elected as a producer's representative on the Cheese Board, and in January, 1923, was appointed as a Herd Testing Officer, in which capacity he was well and favourably known to large numbers of dairy farmers throughout the State. Mr. Pentecost took an active interest in social life, being a life member of the Warwick Hospital and the Nundah Show Society. He was actively interested in bowls, being largely instrumental in forming the Nundah Bowling Club, of which he was the first president.

He is survived by his widow, his daughter Evelyn, and two sons, Lloyd and Allan.

Fruit Marketing—Don't Always Blame the Agent.

Don't always blame the agent when your market returns are disappointing—make sure first that there is no room for criticism with respect to the fruit and its get-up.

Such, in essence, was the advice of Mr. F. Chilton at the State conference of the New South Wales Agricultural Bureau. Discussing fruit marketing from the point of view of the agent, he expressed his desire to correct some of the misapprehensions of growers whose habit it was to blame the agent when results were not profitable. When the prices received did not equal those shown in the papers it was well to remember that there were always—even during periods of glutted markets and low prices—some grades and varieties which realised very fine prices, and the demand for this class of fruit was always greater than the supply. Not only was the production of more high-class fruit desirable, but there was considerable room for improvement in the way in which fruit was presented to the public. It was a common experience for fruit which was undoubtedly beautiful on the tree to arrive overripe or too green, badly packed, or perhaps ungraded. Summarised, Mr. Chilton's advice as to how to make the marketing of fruit more profitable for both agent and grower was—

1. Grow only the kinds and varieties of fruit that succeed in the district.
2. Try to cater for the market requirements as to size, type of case, &c.
3. Endeavour to become a specialist not only in the production of the fruit but in picking, packing, and grading it, and be strictly honest in marking the packages.
4. Advise the agent prior to maturity of the crop of the prospects for both quantity and quality.
5. Adopt the numerical system of packing, or, if using sizes, adopt ½-inch divisions in preference to ¼-inch.
6. Consider the possibilities of cold storage, and look ahead for other outlets for production than are at present available.

Discussing the use of different types of case for various fruits, Mr. Chilton said that grapes and plums seemed to do better in flat or hinged lid half-cases, while peaches, apricots, and nearly ripe pears found a congenial pack in the dump shape of half-case. The flat bushel or "packer" was often condemned for many fruits, but for pears such as Beurre Bosc with long, awkward stalks, there was probably no better package. Thousands of bushels of Victorian apricots, peaches, and pears came to Sydney in this type of case and carried and kept well.

The time to expect a reduction in selling charges, he said in conclusion, would be when the fruit marketed in Sydney consisted of fewer varieties, and those the most suitable; when "special" was easier to find than "plain" grade, and when the packing and get-up generally were of the highest standard—then the average prices realised should be higher than to-day, the selling a much easier and quicker matter, and the business generally more satisfactory for grower, agent, and purchaser.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

INFANTILE DIARRHŒA.

IT is not many years since large numbers of babies in Queensland died every year from diarrhœal diseases. During the years 1890 to 1903 every tenth baby born died before reaching its first birthday (from all causes). During the past five years this mortality has been reduced to a little below one in twenty. On our annual birthrate, which is not far from 20,000, this has meant the saving of nearly 1,000 lives every year, which is surely a remarkable fact. Diarrhœal diseases, often occurring in formidable epidemics in summer months, were the largest cause of the former high death rate. Infectious diarrhœa still causes a considerable number of preventable deaths, and if great care be not taken, a dangerous epidemic is still possible.

Our Best Defence.

Against this our best defence, and our only hope for reducing deaths from diarrhœa to a minimum, is a clear understanding of its causation. Unfortunately there has been no subject on which more obscurity, more confused thinking, more foolish traditions and absurd beliefs have been prevalent. All these have been a direct cause of the high mortality. Until recently nearly every mother when asked the cause of her baby's illness would reply, as a matter of course, "teething," and many think so still, though it is nonsense. This deadly nonsense has been the cause of innumerable infant deaths. Teething never killed anybody. Recently some mothers will tell us that the cause is "gastro-enteritis," or as they call it for short, "gastritis." Unfortunately, these are but names. They convey no knowledge, but hide much ignorance. They are just big words, which send the mind to sleep.

Let us try to make this matter so clear that even the simplest, if they will only attend, can understand. Diarrhœa is the passage of frequent loose or watery motions. It is caused by the presence of some irritating material in the bowels. The bowels are trying to expel this, and so the motions are frequent. The contents of the bowel are being hurried through, and so they are watery. All sorts of things will cause diarrhœa in babies, but we may divide them into two classes.

Food Diarrhœas.

These may occur in artificially fed babies at any time, but are more frequent during hot weather. The baby is given unsuitable food or more food than he can digest, so that the excess ferments inside. Sometimes the system of feeding is wrong. Sometimes his mother is feeding him carefully, but kind friends give him things he ought not to have. If he has learnt to crawl, he may have picked up some rubbish and swallowed it. Perhaps he is being given cow's milk which is stale or dirty and rapidly becomes irritating in hot weather. Perhaps he has been very thirsty on a hot day, and his mother, instead of giving him water, has given him too much milk. Perhaps he has had a feverish illness and his mother has kept him on full diet instead of giving him more water and less food. All these things cause diarrhœa. The treatment is very simple. Give him a teaspoonful of castor oil to help to clear out the irritating material. Give him no milk and stop all food, but let him drink plenty of very weak barley water. Keep him on this one, two, or three days. When he improves give him scalded whey made from junket. If over eight or nine months he may also have arrowroot, cornflour, or sago boiled with water, and if really hungry a small finger of baked bread. When his motions get right, add milk to his food gradually. So treated cost cases of food diarrhœa get well rapidly. Only long-standing and neglected cases are obstinate, and sometimes

Infectious Diarrhœas.

These occur especially in the early summer and are a much more serious matter. Your baby has swallowed disease germs—living bacteria—which are the cause of his illness. Often the attack begins suddenly with high fever and much weakness. Often it begins gradually so that you may think it a simple food diarrhœa, but in spite of castor oil and barley water you find baby is no better next day, but worse. Medical treatment is urgently necessary in all these cases, and you should see a doctor at once.

But the responsibility for preventing these illnesses—for keeping germs from getting inside the baby—rests with his mother. If the baby is on the breast he runs very little risk with ordinary care. If he is bottle-fed, you must take the greatest care. Do not blame the milkman. Boiling or pasteurising kills all disease germs. Therefore the germs must have got into the milk after boiling or pasteurising. They were carried there by flies or by the mother's fingers, and they can be carried into foods made from dried or condensed milk just as easily. The flies may have deposited the germs on the rubber teats, or on the dummy, which you know the baby ought not to have. Constant care and watchfulness are the baby's safeguards. If you do not know how to keep the baby's food safe from infection, the nurse at the Baby Clinic will show you. Do not wait until your baby is sick, for then it may be too late.

THE COUNTRY WOMAN.

By arrangement with the Domestic Science and Technical Services of the Department of Public Instruction, information of especial interest to country women is published regularly under this heading.

Text booklets are available, free of cost, on application to that Department.

INVALID COOKERY.

LIQUIDS AND THEIR PREPARATION.

SECTION II.

A.—PEPTONISED FOODS.

B.—BEEF TEA.

Peptonised foods are useful to persons who suffer from severe indigestion or dyspepsia, to patients suffering from gastritis, or any other disease of the alimentary canal, and to those who are unable for other reasons to take milk in its natural form.

Pepsin and *liquor pancreaticus* are used to peptonise foods; if peptonising is properly carried out the food is partially predigested and is ready to be absorbed without further work on the part of the digestive organs.

When the natural digestive juices are deficient, the stomach and intestines are unable to perform their work; by using peptonising agents patients may be supplied with varied forms of nourishment which otherwise they would be unable to digest.

During the process of peptonisation a slightly bitter taste is developed; this bitterness may be checked before it becomes too pronounced—

(*a*) By quickly bringing the food acted upon to boiling point.

(*b*) By placing the food on ice.

PEPTONISED GRUEL.

Utensils—Saucepan; cup; wooden spoon.

Materials—½ pint thick gruel; ½ pint milk; 15 grains soda; 20 grains peptonising powder.

Method—

1. Make a pint of thick gruel.
2. Add milk; stir in soda and peptonising powder.
3. Keep the mixture warm for thirty minutes.
4. Bring to boiling point quickly; sweeten.

PEPTONISED BEEF TEA.

Utensils—Knife; spoon; saucepan; strainer.

Materials—½ lb. lean beef; 15 grains soda; ½ pint water; 20 grains peptonising powder.

Method—

1. Put water, finely shredded beef, and soda into a saucepan.
2. Bring slowly to blood heat, stirring gently.
3. Keep beef tea at this heat for thirty minutes.
4. Remove from fire; when tepid add peptonising powder.
5. Cover the saucepan; allow it to stand in a warm place for one hour.
6. Strain; bring the beef tea to boiling point quickly; season.

Notes—

1. The tube of peptonising powder contains 20 grains.
2. Twenty grains of peptonising powder are equal to half a level teaspoonful. The half-teaspoonful should be measured lengthways.

PEPTONISED MILK.

Utensils—Saucepan; jug; flannel cover.

Materials—½ pint milk; ¼ pint water; 15 grains soda; 20 grains peptonising powder.

Method—

1. Put milk and water into an enamelled stewpan.
2. Bring to blood heat; put peptonising powder and soda into a jug.
3. Pour warm milk into the jug.
4. Cover the jug; wrap it in flannel and keep it in a warm place for one hour.
5. Pour milk into a saucepan; bring it to boiling point quickly.

Note.—Milk thus prepared may be served hot or cold; it may also be used for various preparations.

FRUIT PRESERVING.

PLUM JAM.

Method—

1. Butter the bottom of a preserving pan slightly.
2. Wash plums well, wipe them dry; if large cut into halves and remove stones.
3. Break some of the stones and remove kernels.
4. Put a layer of fruit into the preserving pan, sprinkle with sugar, add kernels and small amount of water.
5. Add another layer of fruit and sugar, and so on.
6. Allow the preserving pan to stand near the fire till the juice begins to run.
7. Boil slowly for fifteen minutes, add remainder of sugar.
8. Boil till a small quantity sets on a cool plate.
9. Bottle, seal, and cover.

Utensils—Preserving pan, bowl, cloth, knife, chopper, board, wooden spoon, jars.

Materials—1 teaspoonful butter, ¾ to 1 lb. of sugar to each pound of fruit. The amount of sugar needed depends upon the acidity of the plums.

Notes.—

1. Half a pound of cooking apples stewed down to pulp in half a cup of water to each 5 lb. of plums may be put into the pan first.

2. The plums may be prepared twelve hours or more before the jam is made; if this is done they are cut into halves and stones removed, and the fruit is placed on a bowl in layers with sugar between the layers.

DRIED PLUMS

Method—

1. Wipe plums, split them lengthwise, remove seeds.
2. Place fruit on flat tins with the skin downwards.
3. Dry in a warm oven or in the sun; if the latter course is followed, cover the fruit with muslin to keep away the insects.
4. Turn frequently; keep the fruit exposed to moderate warmth till the moisture is evaporated.
5. Pack in boxes with white paper between layers.

Utensils—Knife, tins, boxes, white paper, muslin or net.

Materials—Plums.

MACEDOINE OF FRUIT.

Method—

1. Peel large fruit; cut each into even-sized pieces.
2. Remove seeds from small fruit with a quill, taking care not to alter the shape.
3. Put fruit into a preserving pan; cover with water, bring to boiling point, drain.
4. Make a heavy syrup in a preserving pan.
5. Add fruit to the syrup; simmer for fifteen minutes.
6. Pour into bowls; cover; allow to stand for twenty-four hours.
7. Put fruit and syrup into preserving pans; add sufficient freshly made syrup to cover fruit.
8. Simmer for five minutes.
9. Repeat 6, 7, and 8, three times.
10. Arrange fruit carefully in jars; fill jars with syrup; bottle and seal.

HEAVY SYRUP.

Method—

1. Put sugar, glucose, and water into a preserving pan.
2. Boil till a small portion of syrup taken between the fingers forms a thread.

Utensils—Knife, quill, or small corer, 3 bowls, preserving pan, wooden spoon.

Materials—Small mandarins, cherries, cumquats, plums, figs, pears, apricots, quinces, pineapple.

For Syrup—1 lb. sugar to ½ pint water, 1 teaspoonful glucose.

Note—Almost all fruits may be used in making this preserve.

PASSION-FRUIT JAM.

Method—

1. Wipe fruit well, cut each into halves.
2. Scoop out seeds and juice; put skins into a saucepan; add sufficient water to cover skins.
3. Boil till the skins are quite tender; remove pith from skins.
4. Put it into a preserving pan.
5. Add seeds, juice, lemon-juice, and sugar.
6. Boil slowly till jam sets.
7. Bottle while hot; cover down closely.

Utensils—Cloth, knife, teaspoon, bowl, saucepan, preserving pan, mincer, cup, jars.

Materials—Passion fruit; ½ teaspoonful lemon-juice, 1 cup sugar, to each cup of pulp.

FRUIT MINCEMEAT.

Method—

1. Wash, peel, and core apples.
2. Mince apples, candied peel, raisins, and currants.
3. Add sugar, cinnamon, nutmeg, spice, lemon-juice, and grated rind.
4. Mix well together with brandy.
5. Put into jars, cover down airtight.

Utensils—Knife, mincer or chopper, jars.

Materials—2 lb. apples; ½ lb. seedless raisins; ½ lb. currants; 1 teaspoonful of cinnamon; ½ nutmeg; 1 gill brandy; 1 lemon; ½ teaspoon spice; ¼ lb. peel.

November to March.

PRESERVED MANGOES.

Method—

1. Peel firm mangoes, cut them into thick slices.
2. Make a syrup of 1 lb. sugar to 1 quart of water.
3. Lay mango slices in the syrup, bring to boiling point.
4. Lift fruit out, pack into jars.
5. Boil up syrup for twenty minutes; remove scum.
6. Strain syrup over mangoes in jar till the jars overflow.
7. Seal down and test.

Utensils—Knife, preserving pan, strainer, flannel, bowl, jug, cup, jars.

Materials—Mangoes; 1 lb. sugar and 1 quart water.

MANGO CHUTNEY.

Method—

1. Peel and slice perfectly firm, ripe mangoes; they must be neither green nor over-ripe.
2. Put them into a preserving pan; add vinegar, apples, seedless raisins, brown sugar, garlic, mustard seed (tied in a muslin bag), salt, cayenne, and ground ginger.
3. Boil slowly until the fruit is tender.
4. Bottle and cover.

Utensils—Knife, preserving pan, wooden spoon, bottles, muslin bag.

Materials—To each pound of mango pulp allow ½ lb. apples, 1 pint vinegar, ¼ lb. seedless raisins, ½ lb. brown sugar, 2 oz. garlic, 2 oz. mustard seed, 2 oz. salt, 1 oz. ground giner, ½ oz. cayenne.

Note.—Dates, sultanas, and preserved ginger may be used.

MANGO SAUCE.

To the above mixture add 1 pint of limejuice to each pound of mango pulp; cook till tender; rub through a sieve; bottle and cover down.

Utensils as above with a sieve added.

Materials as above with 1 pint limejuice to each pound of pulp.

PAPAW AND APPLE OR PINEAPPLE JAM.

Method—

1. Peel papaw and apple; remove seeds.
2. Cut fruit into small pieces; put it into a preserving pan; add water.
3. Simmer till the apple is tender.
4. Add sugar and lemon-juice.
5. Boil till a small quantity jellies on a plate.
6. Bottle, seal, and cover down.

Materials—For every pound of papaw take ½ lb. of pineapple or cooking apples, 2 teaspoonfuls lemon-juice, and 1½ lb. sugar.

PRESERVED PAPAW.

Method—

1. Peel papaws; remove seeds; cut fruit into convenient pieces.
2. Proceed as for pears or pineapples.

Utensils—Knike, preserving pan, jars.

Materials—Papaws; 1 cup sugar to 1 cup water.

LAUNDRY WORK.

Treatment of Blankets.

Notes—

New flannels and blankets are often very difficult to wash on account of the sulphur they contain. To remove it they must be steeped in a soft lather of tepid water, melted soap, and ammonia. They can then be washed in the usual way. A breezy day should be chosen for washing blankets in order that they may be dried quickly.

Treatment of Stockings

Notes—

1. Stockings are the only woollen garments to which soap is applied directly; the soles may be rubbed with soap to make them perfectly clean. They must be turned inside out and washed till they become perfectly soft.
2. Stockings must not be washed in water which has been used for white flannel, because the fluff from the flannel sticks to the stockings.
3. After washing, they should be folded along the back seam, passed through a wringer, and hung out by the toes to dry.

Treatment of Coloured Prints and Muslins.

1. Wash the clothes in lukewarm water and melted soap.
2. Squeeze them between the hands. Do not rub them.
3. Rinse them in clean water to which 1 tablespoonful of salt and vinegar for each gallon of water have been added.
4. Stiffen with boiled starch.
5. Fold evenly and pass through a wringer.
6. Dry quickly out of the sun.
7. Damp with warm water.
8. Iron with a moderately hot iron.
9. Fold and air well.

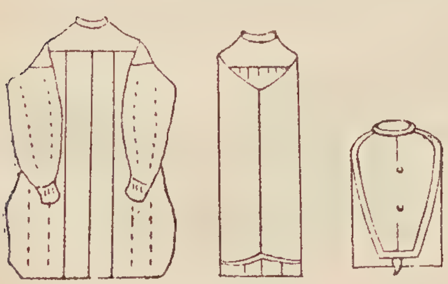
Notes—

1. Pink and blue fade quickly if very hot water is used or if the garment is dried in the sun.
2. Green has a tendency to "run." To check this, before washing the garment should be steeped in water to which 1 tablespoonful of salt to 4 quarts of water has been added.
3. Soap must not be rubbed on coloured garments, because the soda in it affects the colours.
4. Coloured prints and muslins are not as a rule boiled. Some shirting is guaranteed to stand boiling, but it is better to test the material before boiling.
5. Coloured articles must never be allowed to lie about damp.
6. Prints and muslins should be ironed on the right side, unless there is a raised pattern in them. In this case they must be ironed on the wrong side.

Starching, Ironing, and Glossing of Shirts and Collars.

1. Collars, cuffs, and stiff shirt fronts must be starched in cold starch before being ironed.
2. Every article must be perfectly clean and dry. All old starch must be removed. Boiling is the only effective method of removing starch.
3. One tablespoonful of starch is sufficient for six collars or four collars and one pair of cuffs.
4. Stir the starch well from the bottom of the basin.
5. Dip each article into the starch separately, squeeze the starch out of it, and rub it between the hands to get the starch well into the material. Repeat the processes of dipping, squeezing, and rubbing.

6. Starch the cuffs of a shirt first, then the stiff front, taking care that the starch does not get into the body part.
7. Place collars and cuffs separately on a clean cloth, and roll all up tightly.
8. Place the cuffs on the stiff front, and roll up tightly.
9. Allow collars, cuffs, and shirts after being starched to lie in a cool place as long as possible before being ironed.
10. *In ironing collars and cuffs*—
    (*a*) Take one collar or a cuff out of the cloth, place it flat on the ironing table, wipe each side with a clean cloth to remove specks, and push any fullness from top to bottom. A bone paper-knife is useful for smoothing down fullness.
    (*b*) Take a good hot iron, rub it on wax to prevent sticking, and test it on a piece of calico.
    N.B.—1. If the iron is too hot it causes small creases which cannot be removed, and the linen is said to ''mackerel.''
    2. If the iron is too cool, the linen will not become stiff, because the heat is not sufficient to burst the starch grains.
    (*c*) Iron lightly over the wrong side of the collar or cuff two or three times.
    (*d*) Iron heavily on the right side, pressing out creases.
    (*e*) Iron on both sides till perfectly stiff and dry, and polish.
    (*f*) Put the iron across the left-hand end of the wrong side of the collar, and pull the collar sharply through, pressing the iron down with the right hand. If this be done quickly the collar will ''curl'' correctly.
11. *In ironing a shirt*—
    (*a*) Follow directions given in 10 (*b*).
    (*b*) Iron the neckband and yoke on both sides.
    (*c*) Iron cuffs and sleeves. For cuffs see 10 (*c*) (*d*) (*e*).
    (*d*) Fold down the centre of back and iron on both sides.
    (*e*) Flatten out back, smooth it carefully, and put in pleats if necessary.
    (*f*) Arrange front evenly on the back, and iron the soft front.
    (*g*) Place the shirt board under the stiff front, and iron the stiff front carefully, drying it thoroughly.
    (*h*) Gloss the stiff front and cuffs. Fold and air well.
12. *To gloss or polish collars, cuffs, and shirt fronts*—
    (*a*) Heat the glossing or polishing iron.
    (*b*) Clean it thoroughly—the slightest speck of dirt spoils the work.
    (*c*) Damp the outer layer of linen very lightly and quickly with a clean cloth dipped in cold water.
    (*d*) Place the linen on an uncovered polishing board.
    (*e*) Rub quickly and heavily, in one direction only, the surface of the linen until it is bright and polished.
    N.B.—1. Badly ironed or speckled linen should not be glossed, as glossing only makes defects more noticeable.
    2. Chemical preparations are sold for glossing. Great care must be taken when using them, as they are usually inflammable, consequently the linen may be scorched and discoloured.
13. *Diagrams illustrating the folding of a shirt*—



Note.—The cuffs may be folded back so as to appear between the folds on the yoke.

The Washing and Finishing of Laces and Chiffons.

1. White lace should be steeped in cold water to which borax has been added. The proportion of borax to be used is:—1 teaspoonful of rock borax dissolved in 1 tablespoonful of hot water and added to 1 quart of water.
2. Squeeze the borax water out of the lace.
3. Wash the lace in warm water to which melted white soap has been added. Do not rub the lace, but squeeze it gently between the hands.
4. Rinse it in clean warm water.
5. Stiffen it with thin boiled starch, rice water, or gum water.

N.B.—

(*a*) To make rice water, boil 1 tablespoonful of rice in 1 pint of water until the water becomes milky in appearance; and strain the liquid for use as required.

(*b*) To make gum water, put 1 oz. of gum arabic into a jar, add ½ a pint of cold water, stand the jar in a saucepan half-filled with water, keep the water in the saucepan simmering over the fire until the gum is dissolved, strain through muslin, and bottle for use. From 1 teaspoonful to 1 tablespoonful may be added to 1 pint of cold water. For silk laces, gum water only should be used for stiffening purposes.

6. When the laces are clean and stiffened, fold each length evenly and place it between layers of clean white cloth. Mangle several thicknesses at the same time.
7. Iron laces that may be ironed on the wrong side only, pressing out the points with the toe of the iron.
8. Maltese and Honiton lace should not be ironed. They should be pinned carefully by the pattern on a board and left until dry.
9. Chiffon may be washed in the same way as lace, or, after soaking, it may be put into a wide-necked bottle with soap lather and well shaken. In this way handling is avoided. Iron chiffon first with a thin cloth between it and the iron.
10. Black lace may be washed in strong tea. Melted soap should be added if the article is very dirty. Rinse in tea to which gum water has been added, and iron with a cloth between iron and lace to prevent a glazed appearance.

The Washing and Ironing of White Silks.

1. If the silk or ribbon is very dirty, soak it in the same way as lace is treated.
2. Wash it in warm soapy lather, taking care in the case of corded silk not to crack the grain. Squeeze it between the hands or rub it gently with a soft brush.
3. Rinse it in clean water.
4. Stiffen it by using 1 dessertspoonful of gum water to 1 pint of cold water.

Note.—The same proportion of methylated spirit may be added to increase the brightness of the silk.

5. Place the silk between layers of clean calico and mangle it.
6. Iron first with a clean cloth between the iron and silk, using only a moderately hot iron.

The Washing and Ironing of Coloured Silks.

1. Coloured silk and chiffon may be washed in the same way as white with these exceptions—

(*a*) Add salt to the steeping and rinsing waters.

(*b*) Steep only for a few minutes.

(*c*) The water in which they are washed and rinsed must be nearly cold.

(*d*) One tablespoonful of vinegar may be added to the rinsing water to revive the colour.

(*e*) Quick washing and rinsing are necessary to preserve the colour, and the silk or chiffon must be ironed immediately after it has been washed.

2. Black ribbon may be washed in the same way as black lace. See 10 of Laces and Chiffons.

Bran Washing.

1. Embroidered linen and canvas, especially the unbleached varieties, may be washed in bran water. This process gives them a slight stiffness and helps to retain the natural shade.
2. To make bran water—
   (a) Add 1 breakfastcupful of bran to 2 quarts of cold water.
   (b) Boil the mixture for ten minutes, removing scum as it rises.
   (c) Strain, and add 1 quart of cold water.
   (d) Use for washing and rinsing the materials.

Laundry Preparations.

Prussian Blue is a compound of iron, carbon, and nitrogen. Clothes treated by it show rust stains if soap or soda is not entirely removed in the rinsing water

Ultramarine Blue is dearer than Prussian blue, but gives more satisfactory results.

Washing Powders are mixtures of soda, borax, and soap.

Bleaching Powder is made by absorbing chlorine with slaked lime.

Javelle Water or Washing Fluid is made by mixing 1 lb. of soda and ½ lb. of chloride of lime in 5 quarts of water. After the liquid has settled the clear part is poured off and bottled.

Soap is a combination of fat, water, and an alkali. Good hard laundry soap may be made from clean tallow or dripping and caustic soda.

To Make Soap.

Materials—

3 lb. clean dripping; 1 tin caustic soda; 1½ pint cold water; 1½ oz. pearl ash dissolved in 1½ pint hot water.

Method—

1. Melt the dripping in a large pan or saucepan.
2. Dissolve the caustic soda in 1½ pint cold water.
3. Add the dissolved caustic soda to the dripping; stir well.
4. Allow to stand for 24 hours.
5. Cut up the solidified mixture.
6. Add dissolved pearl ash.
7. Melt over a slow fire.
8. Pour the melted mixture into a box lined with a damp cloth.
9. When solid, cut into bars.

Cleansing agents in general—

Dirt may be removed in various ways—

(a) Dry dust may be removed by beating, shaking, brushing.
(b) Dirt that is soluble in water, such as dirt combined with sugar, may be removed by washing in water. Hot water is better than cold for this purpose, as it has greater solvent powers. Soap may assist by loosening the dirt.
(c) Grease may be converted into a soluble soap and removed by washing with water to which soda has been added.
(d) Colouring matters, such as stains, may be removed or bleached by the action of bleaching powder.

Toilet Soap.

Dissolve 1 lb. of caustic soda in 3 pints water, stir occassionally. Melt 6½ lb. unsalted fat or lard and let it cool till both caustic soda and fat are just warm. Then pour the soda and water into the fat very slowly, stirring all the time with a flat stick or wooden spoon till the mixture is like honey. Pour into a tub or tin and leave till next day. Then stir up this soap quickly, add 2½ quarts of water and 1 lb. refined pearl ash. Melt all slowly till the soap is thoroughly dissolved. When the mixture has cooled a little add ½ oz. essential oil of lavender or bergamot. When set, cut up and put aside for a few weeks to harden. Pearl ash is very cheap and can be obtained from any chemist.

Orchard Notes for January.

THE COASTAL DISTRICTS.

ALL orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the regular wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containing no acid phosphate (superphosphate) and only a small percentage of bonemeal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and overripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JANUARY is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one-sized fruit, of even quality and even colour, in a case and packing it so that it will carry without bruising, and, when opened up for sale, will show to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find when the returns for the sale of this fruit are to hand that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then why ''spoil the ship for a ha'p'orth of tar'' after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1) That the fruit must be fully developed, but yet quite firm when gathered.

(2) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

Farm Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstances being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both "grain" and "saccharine" sorghums may still be grown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping "lay-out" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter's friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

NOTICE TO SUBSCRIBERS.
SPECIAL AND IMPORTANT.

Under the Commonwealth Postal Regulations it is NO LONGER PERMISSIBLE to indicate the expiry of subscriptions with a BLUE CROSS on the first page of the Journal. So in the future that reminder will NOT appear.

The need for the strictest economy makes any other form of reminder at present impracticable. THE ONUS OF REMEMBERING THE DATE OF EXPIRY OF, AND RENEWING THE SUBSCRIPTION PROMPTLY IS, THEREFORE, PLACED ON EACH SUBSCRIBER.

As about 1,000 subscriptions expire each month, the cost of a postal reminder is, in present circumstances, prohibitive. Readers will, therefore, appreciate that fact, and will, no doubt, help us to retain their names on our mailing list by kindly noting the date of payment of their subscriptions and, on expiry, sending in their renewals at once.

Instead of just sending the annual subscription—one shilling—along, it is suggested that, when renewing, they do so for two or three years, or even a longer term. For instance, FIVE SHILLINGS would keep a name on our subscribers' register for FIVE YEARS.

By doing this subscribers would help greatly in reducing clerical labour, as well as avoid the inconvenience to themselves of posting annually the very small sum necessary for their registration.

Readers renewing their subscriptions should USE THE ORDER FORM on another page, which should be filled in FULLY and CORRECTLY. Renewals by letter do not as a rule give the essential information, thereby causing unnecessary waste of time and much inconvenience. The Form is also our record, and orders which come by letter require special handling to adapt them to our card recording system.

When an address on the Order Form is not that to which the Journal has hitherto been sent, attention should be called to the new address, and the former address given. This assists us to identify subscribers, of whom we have many of the same name, often in the same district, as well as in different parts of the State.

Women subscribers should add to their names the word "Mrs." or "Miss," as the case may be. This is a constantly recurring omission, and its correction causes a lot of unnecessary labour in checking electoral rolls and other references. Wives and children of subscribers should apply in the subscriber's name, and so facilitate registration.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December, 1931.		January, 1932.		MOONRISE.	
					Dec., 1931.	Jan., 1932.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	4.52	6.30	5.3	6.47	p.m. 11.41	p.m. 11.55
2	4 52	6.30	5 3	6.47	...	...
3	4.52	6.31	5.4	6.47	a.m. 12.16	a.m. 12.30
4	4 53	6 32	5.4	6.48	12.48	1.5
5	4 53	6.33	5.5	6.48	1.21	1.53
6	4.53	6.34	5.6	6.48	1.54	2 47
7	4 53	6.34	5 6	6 49	2.31	3.46
8	4 53	6 35	5.7	6.49	3.13	4.49
9	4 53	6.35	5.8	6.49	4.4	5.51
10	4 54	6.36	5.9	6 49	5.2	6.51
11	4 54	6.37	5.9	6 49	6.4	7.51
12	4 54	6 38	5 10	6 49	7.7	8.48
13	4 54	6 38	5 11	6 49	8.8	9.45
14	4 54	6.39	5.12	6 48	9.9	10.35
15	4.54	6.39	5 13	6.48	10.8	11.24
16	4.55	6.40	5 14	6.48	11.1	p.m. 12.18
17	4 55	6.40	5 15	6.48	11.54	1.3
18	4.56	6.41	5.16	6 48	p.m. 12 42	2.11
19	4.56	6.41	5.17	6.47	1.34	3.7
20	4 57	6.42	5.17	6.47	2.30	4.5
21	4.57	6.43	5 18	6.47	3.25	5.4
22	4 58	6.43	5.19	6.47	4.24	6.0
23	4 58	6.44	5 20	6.47	5.21	6.51
24	4.59	6.44	5 21	6.47	6.19	7 37
25	4.59	6.45	5.21	6.46	7.17	8 15
26	5 0	6 45	5.22	6.46	8.11	8.50
27	5 0	6.46	5.22	6.46	9.0	9.23
28	5.1	6 46	5.23	6.46	9.41	9 56
29	5.1	6.46	5.24	6.45	10.16	10.30
30	5.2	6.47	5.24	6.45	10 50	11 7
31	5.3	6.47	5.25	6.45	11.23	11.49

Phases of the Moon, Occultations, &c.

3 Dec. ☽ Last Quarter 2 51 a.m.
9 „ ● New Moon 8 16 p.m.
17 „ ☾ First Quarter 8 43 a.m.
25 „ ○ Full Moon 9 24 a.m.

Perigee, 7th December, 4.6 a.m...
Apogee, 18th December, 9.42 pm

By the middle of December Mercury and Mars will be closer together with the more brilliant Venus above them, nearer to the stars in the bow of Sagittarius and Saturn about the length of the Southern Cross higher up.

The Moon, being absent for the first 10 days, then with only a narrow part of her disc illuminated by the 15th, opportunity will be afforded to watch the movements of the three planets favourably. So quickly will Mercury change its position with regard to the Sun that it will be passing from east to west of the latter on the 21st, although it will be above the horizon with Mars and Venus for an hour after the Sun on the 15th.

By the end of the month Mercury will be no longer visible in the evening. Mars, too, will disappear soon after the setting of the Sun; but Venus, with increased brilliance, will have passed Saturn on the 19th and crossed the eastern border of Sagittarius, apparently into Capricornus.

Early in the morning of the 23rd the Sun will reach its furthest distance south of the celestial equator and our summer solstice will occur.

Mercury will set at 8.10 p.m. on the 1st, and at 7.38 p.m. on the 15th.

Venus will set at 8.8 p.m. on the 1st, and at 8.28 p.m. on the 15th.

Mars will set at 7.43 p.m. on the 1st, and at 7.32 p.m. on the 15th.

Jupiter will rise at 11.30 p.m., and set at 10.26 a.m. on the 1st; on the 15th it will rise at 10.34 p.m., and set at 9.31 a.m.

Saturn will rise at 7.56 a.m., and set at 9.34 p.m. on the 1st; on the 15th it will rise at 7.7 a.m., and set at 8.45 p.m.

On Christmas Day the Moon, though full, will not rise till about half an hour after sunset. When it reaches its highest point, the meridian, about midnight it will be more than half way down towards the northern horizon, everywhere south of Cairns.

The Southern Cross will be erect and at position XII. at 8 a.m. on December 1, and at VI., its lowest position, at 8 p.m. At the end of the month it will be at these positions two hours earlier.

---

1 Jan. ☽ Last Quarter 11 23 a.m.
8 „ ● New Moon 9 29 a.m.
16 „ ☾ First Quarter 6 55 a.m.
23 „ ○ Full Moon 11 41 p.m.
30 „ ☽ Last Quarter 7 32 p.m.

Perigee, 2nd January, 8.48 p.m.
Apogee, 15th January, 7.6 p.m.
Perigee, 27th January, 7.0 p.m.

Spica, the brightest star in Virgo, will be occulted by the Moon on the 2nd and the 29th, but on both occasions the Moon and planet will be below the horizon in Queensland. The occultation on the 5th of Antares, the brightest star in the Scorpion, will also be invisible.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

QUEENSLAND AGRICULTURAL JOURNAL.

VOL. XXXVI. PARTS 1 TO 6.

GENERAL INDEX.

PAGE.

D.

E.

F.

G.

PAGE.

H.

I.

K.

L.

M.

INDEX TO ILLUSTRATIONS.

INDEX TO ILLUSTRATIONS—*continued.*

FREDERICK PHILLIPS, Government Printer, Brisbane.